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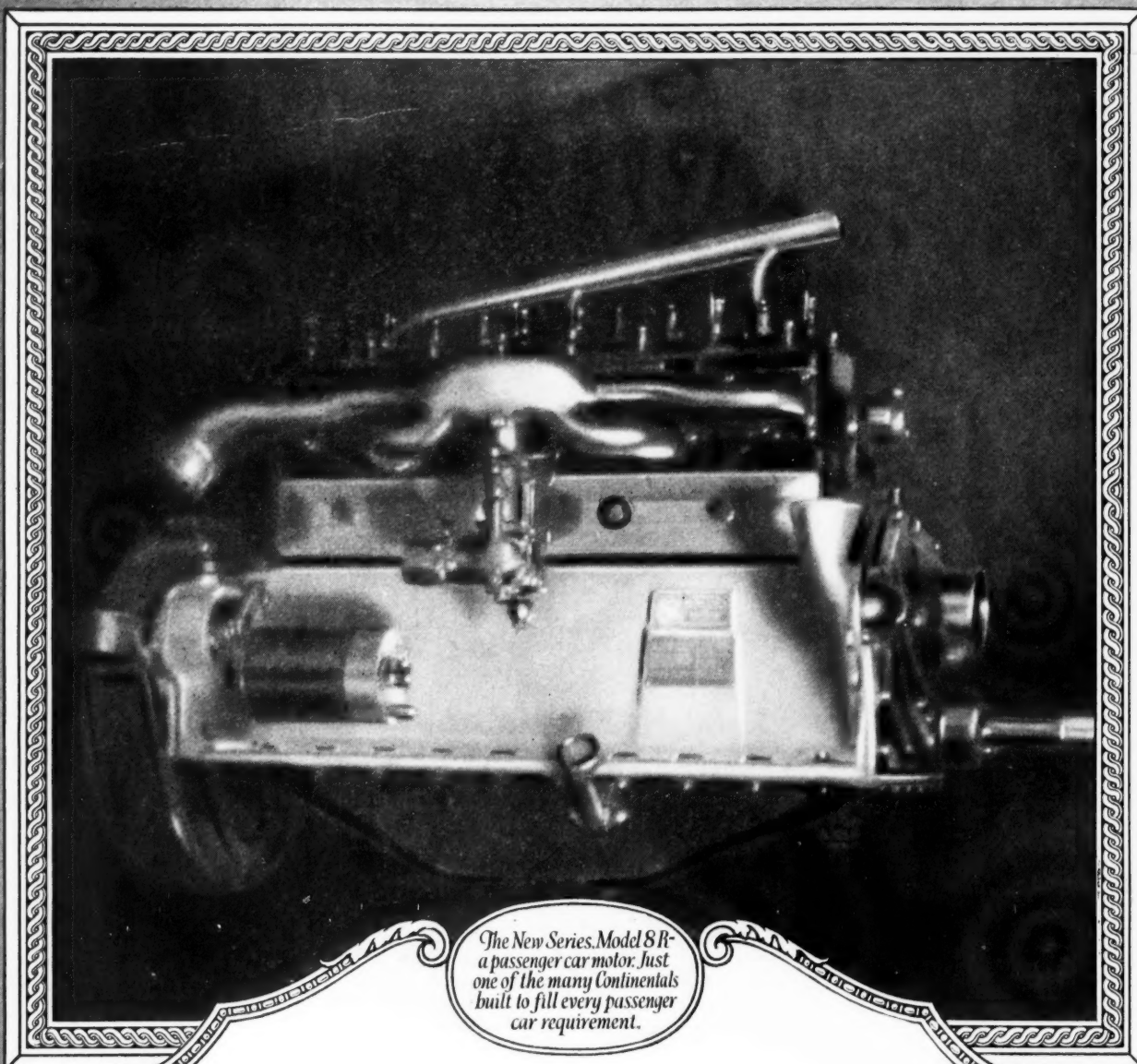
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VOL. XLVIII

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No. 21

Tire Merchandising— How It Can Be Improved

THE article which begins on the next page is the first of a series which will discuss tire merchandising from a critical standpoint with a view to suggesting constructive remedies for the difficulties now present.

This first article tells about the following things:

UNSOUND PRACTICES

Long datings
Special brands
Inflated list prices

Direct sales to fleet owners
Below-cost sales
Unbalanced dealer representation

CAUSES

Excessive production capacity
Resulting keen competition
Retention of obsolete practices
Lack of statistical data for planning

REMEDIES

Conservative expansion programs
Revision of sales practice
Making legitimate dealer profit possible
Elimination of unsound methods

Spring dating will be discussed in detail in the second article of the series. Facts will be presented showing that it has outlived its usefulness and that it has resulted in numerous merchandising evils. The probable benefits to be derived from its elimination will be outlined.

Later stories will deal with list prices, dealer profits, territorial protection for retailers, relation of automobile manufacturers to tire marketing, use of public warehouses in tire distribution, and selling to foreign countries.

Revision of Marketing Methods Is Needed in Tire Industry

Long datings should be eliminated. Retailers want reasonable territorial protection. Special brands, inflated list prices, and direct sales to fleet owners might well be discontinued.

By Norman G. Shidle

ECONOMICALLY unsound sales practices which have grown up in the tire merchandising field have been the result of intensely keen competition. Some of them have appeared only in the past few years but others are worn-out antiques which have no place in present-day business when success depends upon efficient marketing methods.

One of the ancient evils, the mileage guarantee, fell by the wayside a year ago, but its equally evil brother, spring dating, remains to clog up distribution channels.

The size and solidity of the tire industry offer ample evidence of much sane and efficient sales work by manufacturers. Ultimate solution of marketing problems is assured but it will be hastened by dragging them out into the open and considering them frankly. Analysis of the difficulties involved and an attempt to suggest constructive remedies will be helpful, therefore.

Tire manufacturers have recognized for some time the unsound character of many tire merchandising methods, such as spring dating, direct factory sales to large commercial accounts, inflated list prices and special brands.

Entire accord has not been reached, naturally, on some of the problems but there is rather general agreement on most of the major points. Specific remedies do not meet with general approval, however, even in cases where it is agreed reforms are needed. As a consequence analysis of causes and trends is required if equitable and permanent cures are to be effected.

The fundamental difficulty seems to be an improper relation between manufacturing capacity and tire demand. The tire industry grew too fast at one period of its career.

This statement may seem a bit exaggerated in view of the enormous demand for tires, but it stands up under analysis.

Demand for a product in a business sense does not become actual until it is translated into sales at a profit. Many women want diamond rings, but the actual demand is limited to those financially able to purchase them.

Competition Is Keen

In a business where competition is as sharp as in the tire industry, the margin between selling price and production cost tends to approach zero. Certain companies reach the fated zero mark sooner than others. Weakly financed organizations fail while stronger ones weather the storms, and the industry finally becomes stabilized on a basis which provides fair profits for all, notwithstanding keen competition.

It is extremely difficult for an individual manufacturer to determine just what stage his industry is in at a particular period. It may take a long time to reach the period of stabilization, because new capital, failing to see how close to zero the margin of profit has approached, continues to take the place of old capital with which companies that failed were financed.

Several well-informed tire manufacturers have stated, for example, that one of the most troublesome elements of competition is that of small companies which sell tires below cost or without adequate profit for six months or a year, or until they fail. Then somebody else buys the factory, forms a new company, and the process is repeated. These plants have expanded tire production capacity and the difficulties of selling at a profit through stabilized channels has been increased.

Even soundly financed manufacturers have been guilty of over-optimism in boom times. Tire builders were hit even harder than any other automotive interest when the business decline began in 1920. Production facilities were being enlarged to take care of an ever-increasing demand and raw materials were being purchased on the same basis.

Suddenly the slump came. Huge stocks of tires filled warehouses and dealers' shelves throughout the country. The volume and rapidity of the recession made the situation peculiarly acute. Tires had to be sold on any terms possible. They were.

Meeting a Crisis

There was no time to think about using permanently sound merchandising methods. A crisis existed and the tire industry met it courageously and successfully. Taken as a whole it came through the storm of depression with flying colors.

But like a ship that has faced the elements in mortal combat, it bears the scars of conflict. These scars consist largely of merchandising practices which do not make for the best interests of the various factors in the distribution system. The scars cannot be effaced immediately because the tide of battle has not entirely subsided. Productive capacity is still so large as to make competition so intensely keen that some companies still may compete themselves out of business.

Immediate improvement in the tire merchandising situation is possible nevertheless, and it is already under way.

Tire manufacturers in 1921 learned a lesson about the dangers of over-expansion which is still etched sharply in their memories. Little factory extension is being carried forward now, despite the tremendous demand in recent months. The new automobiles which have gone into service in the last two years have increased enormously the market for tires and a proper balance between capacity and demand is rapidly being approached.

Retail sales organizations are being revamped extensively throughout the tire field. More dealers are being placed in certain territories which heretofore have lacked adequate representation. They are being weeded out in other places, where there have been so many that the able and progressive dealer has had little incentive to push his tire lines.

A strong feeling exists that wide enough use has not been made of the car and truck dealer as a tire distribu-

tion agent. Taken by and large, the man capable of financing and operating an automobile agency is a high type of merchant. The sales equipment, merchandising ability and general efficiency of an automobile dealer in any town usually gives him an advantage over other tire merchants.

The ability of the automobile dealer to sell tires already has been demonstrated to an extent not fully recognized by some tire companies. The idea that the exclusive tire dealer is the most efficient has been accepted too generally without sufficient examination of all the evidence. The distributor for one of the better-known of the small tire manufacturers in a Pennsylvania city, for example, when asked who was his best tire dealer, named an Oakland dealer in a nearby town.

"His sales and service organization sells tires to car buyers and service patrons," the distributor said. "His salesmen also solicit considerable commercial account business which yields good profits for the house and extra commissions for themselves."

Many similar cases could readily be cited in other territories. The automobile dealer, by the very nature of his work, is thrown into constant contact with car owners of every kind. Seeking new prospects, he must meet as many owners of competitive cars as possible, while he has a continuous stream of owners in and out of his service station.

Departmentalized car dealer organizations are becoming more common every year. Special men are being assigned to the operation of a distinct parts and accessory division. They concentrate their entire time and attention on selling automotive equipment. In some cases, a separate tire department is installed when a tire account providing the proper incentive is available.

Car Dealer a Good Tire Salesman

The trend toward departmentalization is going on even in the smaller towns. Although the size of a dealer's business may not warrant a physically separate department, a special man may be assigned to handle equipment sales. As this movement progresses, the automobile dealer becomes constantly better able to handle tire accounts progressively and profitably.

Automobile dealers have not sold nearly as many tires in the past as they might have done, simply because of the uneconomic methods prevailing in the retail tire marketing field. Given a fair discount and reasonable territorial protection, however, they provide an excellent distribution channel for tires. Constant contact with owners, through salesroom and service station, added to general merchandising ability equip them admirably to get maximum distribution in their territory for any given tire, provided always that the tire manufacturer gives reasonable protection against unfair competition.

Size and quality of the dealer organization constitutes one of the chief problems confronting the tire industry today, because many factors are involved, some of which are rather complex.

Another forward step is found in the action of some companies in taking a firm stand against certain merchandising practices which they consider unsound. Having braved the danger of giving competitors an advantage, they are finding greater profits in adhering to sound methods than in seeking temporary gains through devices which create future difficulties.

One company, for example, has discontinued the practice of selling direct to fleet owners and large commercial accounts, except in a few specific cases called national accounts. These customers formerly were sold at dealer discounts. Recently prices were raised to these accounts, enabling dealers to sell them at a profit.

When this policy was decided upon, a considerable de-

crease in fleet owner business was expected, but no marked decline has resulted. The increased selling effort which the local dealer applies, together with the special service facilities which he provides, has made it possible to keep fleet owner sales very nearly up to the previous mark. Greater stability and increased sales effort in the dealer organization is making ample recompense for the slight decline which has resulted.

Another company which formerly did considerable original equipment business adopted a policy of making such sales only at a reasonable profit. Much of this particular type of business was lost, of course, but additional effort concentrated on replacement sales has given a highly favorable balance sheet.

Many Merchandising Evils Remain

These are examples of progress, but many evils remain, some of considerable importance.

Spring dating is one of the most firmly entrenched of the merchandising practices which hinder efficient tire marketing. The custom of shipping tires to dealers in December and January, permitting them to pay three, four or five months later, works harm to both parties in the transaction.

The manufacturer is placed under a heavy financial burden, in most cases making spring dating shipments on open accounts. Moreover, the manufacturer has to make good any price decreases that may go into effect during the dating period, while the dealer takes advantage of increases.

If there is a slump in business, the tire maker is faced with poor collections or returned inventory. If the dealers have succumbed to the arguments of enthusiastic salesmen and bought more tires than they can sell, as frequently happens, the result is the same.

The dealer who permits himself to be overloaded, as many of his neighbors probably have been, suffers far more from the inevitable price cutting in an effort to get rid of surplus stocks than he benefits from long terms.

Justification for long dating may have existed at one time, but that time has long since passed. Automotive equipment selling is now an all-year-round business, and

LITTLE relation exists between tire list prices and what the buyer actually has to pay. Price cutting has been made possible by certain merchandising practices which are not economically sound. Public confidence in tire values has been destroyed to a considerable degree.

Most of the difficulties can be eliminated by courageous, definite action on the part of tire manufacturers. The industry is thoroughly sound both as to markets and quality of product. A real opportunity exists to make tire merchandising more profitable to both manufacturer and dealer.

has outgrown many customs which still adhere to the tire trade.

Multiplication of dealers in some territories to such an extent that profitable business for any one is a practical impossibility is another evil.

Prices set by manufacturers with the idea of permitting "bargain sales" by dealers have encouraged the so-called "gyp" and have made millions of automobile owners wonder what a tire list price means—if anything.

Special brands of tires, produced only for a single distributor, often compete with the standard brand of the same manufacturer and hurt the business of a regular dealer located, perhaps, across the street.

Tire dealers often find themselves unable to compete against factory branches for business with fleet owners because the factory quotes prices to these large commercial accounts approximately as low as those which the dealer must pay.

Following in the train of these evils, most of which the tire manufacturer has power to control, come other unfavorable marketing practices which have been more or less forced on the tire industry. Car makers buy tires at cost or less than cost and in some cases have abused this privilege by going into the tire business themselves in a small way when they needed money badly. Spare tires, placed on cars as original equipment, have taken sales away from tire dealers.

Spare Tire Trouble Clearing Up

This trouble seems to be clearing up rapidly, however, and it is not likely to be a serious menace to merchandising stability in the future. The president of one tire company, as a matter of fact, says that no financially sound car manufacturers ever did sell to their dealers tires that were supposed to have been used for original equipment.

Control of the spare tire situation is being exercised in several ways. Tire makers are watching car production schedules closely to hold shipments down to a set per car, and are discouraging spare tire equipment. Many car builders, moreover, have voluntarily discontinued the practice of putting one or two spare tires on the car before it leaves the factory. Except on sport models, few cars are now being shipped with extra tires.

Difficulty is still experienced, however, in getting car dealers to refrain from substituting tires of a different make for those with which the car is originally equipped. This practice is made profitable for the car agency by some local tire dealers who substitute their own brands for those originally on the cars, making a special price to the automobile dealer and taking the original equipment off his hands.

Unfavorable reaction from this custom comes to the tire manufacturer in two ways: first, he fails to get any advertising value from the original equipment, which he sold at small profit partly for that purpose; secondly, his tires are thrown on the market at a bargain price in competition

CAR dealers provide an excellent channel for the distribution of tires. They come into constant contact with automobile owners through service stations and through seeking new sales.

Separate automotive equipment departments are becoming common in car dealer establishments, while a special division for selling tires has long since ceased to be a novelty.

with those which must be sold at a standard price by his regular dealer.

To exercise control of this condition is difficult. Neither the tire manufacturer nor the car builder has direct power. The latter, however, may have considerable influence. It would not be surprising if tire makers appealed for help directly to the automobile manufacturers in the near future.

Lack of statistical data makes it possible to discuss trends in the tire trade only in a general way. Accumulation of statistical facts about the industry will be helpful for manufacturers in making future plans and considering current problems. Little of analytical value has been developed thus far in the way of statistics.

Elimination of spring dating is objected to by some tire makers on the score of limited warehouse facilities to take care of stocks which might accumulate. How much basis there is for this contention has been discussed within the industry for a long time. No definite effort has been made, nevertheless, to obtain accurate data concerning retail sales by months for correlation with the figures on production, shipments and inventories. If such figures were available over a period of years, the question could be answered definitely. But even the production, shipment and inventory figures are not adequate for accurate study of trends. The facts available do not include information from all manufacturers, at least one important producer being missing. The number of makers reporting is different each month, thus making the figures for one month not strictly comparable with those of any other months.

The value of the entire tire industry of reasonably complete and accurate statistical data can readily be understood and the sooner definite efforts to collect and compile information of this kind the better it will be. The value of such information lies, not in any knowledge that might be given of a competitor's business, but in the trends and tendencies that may be revealed for the entire industry.

Study of actual facts, as shown by statistical records, often discloses a condition quite different from that commonly accepted even by men thoroughly familiar with the industry.

Facts Disprove Theory

The passenger car field presents a case in point. It has been commonly stated in the automotive industry that car production for the first three months of the year is about normal; that it increases in the second quarter to take care of the usual spring rush; that it declines somewhat in the third quarter, and that it goes down again in the last quarter as there is naturally less buying in the winter.

But plotting the quarterly production of passenger cars since 1912 shows that each yearly curve follows this generally accepted seasonal outline scarcely at all.

In only 7 out of the 11 years plotted was the second quarter the largest of the year. In other particulars the actual condition fails to a greater extent to check with the theoretical seasonal conception. It is true that the variation can be explained in each case by a knowledge of current business conditions, but the facts show that there is a variation far oftener than not.

This indicates, in the case of the passenger cars, that the volume of production is influenced far more strongly by current business and economic conditions than by seasonal factors.

It is perfectly possible that the same condition would be proved true of tire production and shipments if figures were available over a sufficiently long period to make any reasonable analysis. Figures on the tire industry, properly compiled and analyzed, might prove of inestimable value to tire executives. They will give each manufacturer, not a knowledge of what his competitor is doing, but some concrete basis upon which to plan what he should do himself.

It takes a long period to collect enough information of this kind to be of much use. The automobile industry is only now really beginning to profit from the accumulation of statistical data which has been going on since 1903 or thereabouts.

Immediate improvement in certain merchandising practices can be made, however, without waiting for the accumulation of any information other than that which is at hand.

Enough evidence seems to be available to convict spring dating of being guilty of injury to manufacturer and dealer alike. Progress toward the elimination of this practice might well begin at once.

Stabilized dealer organizations are essential to permit prosperity in the industry. These cannot be obtained without providing reasonable territorial protection for each dealer when he is given the agency for a particular tire.

The elimination of special brands would benefit regular tire dealers and would directly help the manufacturer in the long run.

Tires should be priced on a basis of cost plus a reasonable profit for the distributor and dealer. Inflated prices, designed to permit the dealer to give customers fictitious discounts, cause confusion of tire values in the minds of buyers and thus make legitimate tire selling difficult. Every manufacturer is damaged by such a condition if he is in business on a permanent basis.

Tire production facilities should be expanded only on a conservative basis and production schedules should be made with close attention to current economic trends. Monthly car production and registration figures are only one element in a rather complex economic picture.

All of these things cannot be done in an instant, but progress can be begun without delay. Methods for achieving constructive ends are already being worked out and will be further developed as time goes on.

Good Prospects for Motor Transport Development in Kenya

BRITISH EAST AFRICA totals above 750,000 square miles. The four countries composing this area are Kenya, formerly known as the British East African Protectorate; Tanganyika, formerly German East Africa; Uganda, and the island protectorate of Zanzibar. Each should be the subject of separate study by motor exporters.

One thing these four British colonies certainly have in common is the lack of transport facilities and, until development in this direction is much further advanced, it would be inadvisable to have any representative other than one in Nairobi, the chief town in Kenya.

Kenya is, roughly speaking, about one-third of the total area of British East Africa. It has a native population of about 2,500,000. Its European population is barely 10,000, about 25 per cent of which are planters and farmers, 10 per cent commercial men, 9 per cent Government officials. In addition there are about 35,000 Indians and Arabs, many of whom are potential car or motorcycle buyers. Of the 1102 cars, 39 trucks, 1001 motorcycles and 64 tractors registered in Kenya during 1921, Asiatics owned 16 per cent. The per capita ratio of motor vehicles to white population is 1 to 5½.

At the present time there is one main railroad line, known as the Uganda Railway. Several branch lines are either projected or being constructed. Railway construction, however, is both difficult and expensive. Settlers realize fully that it is not railroads so much as highways that are needed at present.

Motor roads are springing up over the southern districts, some extending as far as 200 miles from the railroad. There are only about 50 miles of metalled roads in the Colony, but the 3000 miles of unmetalled highways are for the most part usable in anything but the wettest weather. Basalt and limestone are used for road metalting, but where these are not available murrum or soil surfacing is resorted to.

To show how keen the settlers are about motor transport and to indicate how they expect it to develop is exemplified by the fact that the capital, with its few hundred motor vehicles, is engaged at the present time in solving its parking problem.

Some of the roads reach as high as 9000 feet above sea level. Thus it will be seen that carburetion must be considered by exporters with their eyes on this market. Gasoline costs \$1.50 per gallon in Kenya. This, together with evaporation and loss of power owing to altitude, make the cost of operation of gas propelled vehicles very high, and many of the trucks in use run on kerosene.

There is no speed limit in Kenya, and water, generally speaking, is easily obtained. Indians supply most of the

skilled labor, but African drivers soon become proficient enough to do roadside repairs. Indian mechanics get from \$60 to \$150 per month and African drivers from \$15 to \$30 per month. Repair work in garages is generally of a poor order and it is often found more economical to replace parts rather than repair them. Tire presses are available in most of the towns, and solid tires, combined with shock absorbers, generally afford comfortable running.

The Kenya ideal of an automobile is somewhat as follows: Price, \$1,750 to \$2,000 c.i.f. Mombasa; engine, 20 hp. with four cylinders; 5-seater or box body; clearance, 11 to 12 in. but never less than 9 in.; 25 to 30 m.p.g.; 40-45 m.p.h.; 815 x 120 mm. tires; electric lighting and starting if possible, but magneto essential; limit of car weight, 18 cwt.; top gear ratio should be between 4.5 and 5 to 1. The sellers of such a car should have an agent in the country equipped with all necessary spare parts.

High Freights a Handicap

High shipping freights prove a serious handicap, and often by the time a buyer takes over a vehicle it costs more than double the retail price in the exporting country.

Motorcycles are not only largely used by white settlers but by Asiatics as well. These are a very popular means of conveyance among Government officials. Motorcycles and sidecars are also displacing rickshas for town traveling.

The most suitable type of motorcycle should not cost more than \$600 in East Africa. A solo machine should be 4 hp., a combination 7 hp. The frame and stays should be very strong, clearance should be about 6 in., but the frame should be constructed so as to give a low riding position. The carbureter should have an adjustable jet, the saddle should be well sprung and of the cantilever type, and the tires 3 in. wide. The mudguard should be wide and there should be at least 3 in. between tire and mudguard.

Good clearance also should exist between forks and wheel rims; the magneto should be high, just under the tank, if possible; the back brake should be internal expanding, with a rim brake in front. An all chain drive with easily detachable case; footboards, not rests; controls of Bowden cable for throttle and air, but a lever at the side of the tank is regarded as being better for spark controls. A kick starter should be fitted, assisted by a decompressor. The weight should not be more than 2½ cwt.; plating should be cut down to a minimum, while splash-boards should protect the rider's legs.

Just Among Ourselves

New Engines Aid Dealers To Sell Used Trucks

A PLAN which has done much to lighten the used truck burdens of its dealers has been worked out by the Federal Motor Truck Co. In many cases, it is said, use of the idea has permitted dealers to turn over a larger profit than on the sale of a new truck. It is conceded that the motor in a truck wears out more rapidly than any other essential part. The company, therefore, provides its dealers with new engines for \$350. With a truck repainted and a new engine installed it frequently is almost as good as new and is readily salable at a good price. Dealers who ship old motors back to the factory, where they are scrapped, are given credit on the purchase price of the new. Any dealer can install a new engine in his own repair shop. Each dealer is required to fill out a questionnaire giving the facts about the old engine and the other parts used in the truck he wishes to recondition.

Tennessee Mountain Boys Used to Man Plant

UNLESS business lets down in the next few weeks the labor problem is likely to be acute the coming summer. Skilled workers have been employed for many months at high wages and they are in a position to be more or less independent. Many of them don't like to work in hot weather and they are quite likely to take voluntary vacations. One company in the parts field which has had considerable trouble in getting help has solved the problem in part by bringing to its plant a couple of coach loads of mountain boys from Tennessee. They are easily trained and they don't mind hard work. The rate for common labor in their state averages

only about \$1.50 a day and many of these chaps feel like millionaires with the pay they are now getting.

Durant Dealers Will Not Sell All Cars in His Line

MUCH discussion has been heard about Durant's plans for building up a dealer organization to take care of steadily expanding production. A good many persons in the trade have expected that his dealers would handle the complete line but such is not likely to be the case. Generally speaking, Star dealerships will be exclusive and the same will be true of the Princeton, which will compete with Cadillac, and which will be ready for the market about August 1. The Locomobile and the Flint, which will compete with Buick, will be grouped together. The same will be true of the Durant four and six. The Star Special, which will compete with Chevrolet, will be handled by Star dealers. Standardized buildings will be provided for Star dealers and the first of them will be erected in the near future. They are designed to be models of their kind and plans for them have been practically completed. The only variation, it is understood, will be in size.

WILL Rogers is rather well known to the men of the industry after his appearance at two automotive dinners during New York show week. He spoke to the members of the United States Chamber of Commerce the other day and his quips have lost none of their punch. "I'm glad to welcome you Babbitts to New York," he said, and most of the delegates seemed to "get" him. He added that the transportation shortage would be ended instantly if people would quit holding conventions and

cluttering up the trains getting to them. All conventions do anyway, he insisted, is to pass resolutions and then promptly forget all about them.

Durant Bank Plan Causes Anguish in Wall Street

NOTHING which has happened recently has caused Wall Street so much anguish as the Durant bank plan. The "street" likes Durant and his methods even less than it likes Ford. Plans for opening the bank are progressing steadily. A national bank charter already has been obtained from the comptroller of the currency and the name of an old bank was bought more than a year ago. It will not be Durant. The institution will be located near the lower end of Central Park and far from the banking district. Loans will be made on substantial collateral without discounts, premiums or other money making devices. Parts makers, for example, will be able to borrow money at a fair rate if they produce satisfactory security. Incidentally, reports persist that Ford proposes to establish a chain of banks.

No Secret Reason Found For Sloan's Promotion

THERE appear to be no "secret" reasons for the elevation of Alfred P. Sloan, Jr., to the presidency of General Motors. When Pierre S. du Pont accepted the presidency in succession to W. C. Durant it was understood he would retain the office only a short time and he waited longer than was expected before becoming chairman of the board. The date of his retirement had been a subject of speculation for more than a year and it had been generally accepted that he would be succeeded by Sloan, one of the hardest working men in the in-

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

dustry. No change in policy or methods of operation will be involved. Sloan gets a title which he has earned and no readjustments of the machinery will be necessary. He will continue in charge of operations and it is doubtful if a vice president will be elected in his place.

British Motor Tax Would Make Americans Gasp

AMERICAN motorists sometimes feel that registration fees are pretty steep, and they are, but they might be a lot worse. Great Britain issued 1,367,198 motor licenses in 1922 and received in fees 12,321,000 pounds, or the equivalent of about \$60,000,000. Registration in the United States last year was 12,364,377 for which motor vehicle owners paid \$152,047,000 in registration fees. If the fees in this country had been on the same schedule as in Great Britain, the bill would have been something like \$550,000,000. Notwithstanding the high taxes the number of vehicles in use in Great Britain increased 26 per cent in 1922 as compared with the preceding year.

EXPORT managers for motor vehicle manufacturers are trying to induce the National Foreign Trade Council to hold its meeting in Detroit next year. Their chief purpose, it is understood, is to sell the sales executives of their companies more thoroughly on the importance of export trade. It seems strange that there should be a sales manager in the industry who is not thoroughly conversant with the tremendous potentialities of foreign demand for American automotive products. The chances are that economic conditions will convince these doubting Thomases before the end of the year. Exports are going up by leaps

and bounds and if they don't go after their share something is radically wrong with them.

New Models to Include Some Important Changes

UNUSUAL interest is being displayed for this time of the year in the new models which will begin to appear in a few weeks. Several will contain rather striking engineering changes. Four or five, at least, will be equipped with four wheel brakes. It has been persistently reported that two widely known cars would be powered with "straight eight" engines, but it can be said that only one of those usually mentioned will contain power plants of this type. Considerable general progress will be apparent in mechanical simplification and refinement. Many of the refinements will be evident to engineers rather than to laymen and are made possible by the accumulated experience of years.

Freight Car in Motion Described as Rarity

STORE door delivery is coming, slowly but surely. Its development will be evolutionary rather than revolutionary. Its economic advantages are admitted almost universally by shippers and the carriers have almost arrived at the point where they will take it up seriously. Shortage of terminal and storage facilities will drive them to it, if nothing else. W. J. L. Banham, president of the Associated Traffic Clubs of America, one of the pioneers in the movement, characterized a moving freight car as "the rarest thing in the country," in a talk at the United States Chamber of Commerce convention. "When you think of a freight car, you think of one standing still," he said, although some one is paying de-

murrage on every car not in motion. He declared cars shouldn't be used for storage and that if the terminal problem is solved a long step will have been taken toward solving the transportation problem. Store door delivery will do it.

Macing Motorists Again To Get State Revenue

THE sovereign state of Pennsylvania needs more revenue for the next two years for sundry purposes. When a commonwealth needs more cash it has to hoist taxes. It's a perfectly simple proposition and involves only one political consideration. That is imposing the new taxes where the plucking will cause the least squirming. That seems to be the economic foundation for picking on the owners of motor vehicles. Therefore the devoted legislators of the aforementioned sovereign state of Pennsylvania have decided upon a flat 50 per cent increase in the license fees for all motor vehicles and an increase in the gasoline tax from one cent to two cents a gallon. This minor operation upon the pocketbooks of some 900,000 of its fairly well to do citizens is expected to yield the trifling sum of \$18,000,000 for the next two years, or something like \$20 for each of the faithful 900,000.

PIERRE duPont isn't the only man in the automotive industry who is a firm believer in life insurance, although he carries more than any one else with policies aggregating \$4,000,000. John N. Willys has his life insured for \$1,800,000 and other automotive men in the \$1,000,000 class are C. S. Mott, vice president of General Motors Corp., F. O. Bezner of Los Angeles, C. B. Hayes of Jackson, Mich., and Harvey S. Firestone of Akron. J. D.

Thirty-Three Cars Expected to Start in 500-Mile Indianapolis Race

Twenty-four American models compete in annual speed test.
Nineteen entries will use eight-in-line engines.
France and Germany to be represented.

THIRTY-THREE cars, each equipped with 122 cu. in. engines, are expected to start in this year's 500-mile Race to be held at Indianapolis on Memorial Day. A total of 35 entries has been announced, but the number will be reduced in the elimination trials to 33, the maximum permitted on the track.

Of the 35 competing chassis, 24 are American built products, 7 are French and 3 German. Among the American entries are three Packards, three Duesenbergs, four Scheel-Frontenacs, seven Durant specials, two H. C. S. specials and one Miller special, the last ten mentioned being the products of the Harry A. Miller shops. A Duesenberg chassis fitted with a Miller engine won last year's race. In addition to these there are four other individual American entries about which little is known at the present time except that one is being built in the Miller plant and that one will be a design based on the Ford chassis, said to employ about 75 per cent of Ford parts, together with certain special parts designed to convert the car into a racing chassis.

Of the seven French entries, five are Bugatti cars which are said to be substantially stock products, incorporating such minor changes as are required to fit them especially for the conditions and rules to be met in the Indianapolis Race. The two other French entries are the Rolland-Pilains, one of which has a non-poppet type of valve and is known as the Schmidt special.

The three German entries are all Mercedes chassis, fitted with bodies designed to carry both a driver and a mechanic. All the other cars in the race are expected to have bodies seating the driver only and can therefore be made exceedingly narrow to minimize head resistance.

As usual, considerable secrecy has been maintained concerning details and even major features of construction of most of the cars entered. AUTOMOTIVE INDUSTRIES is, however, able to give, in the following pages, a fairly detailed description of some of the entries.

Packard

Few details concerning the Packard cars have as yet been released, but it is known that they will be fitted with six-cylinder engines of 2.543 in. bore and 4 in. stroke. These cars have a 100 in. wheelbase and are said to be close to the 1400 lbs. minimum weight allowable under the rules. It is understood that the general lines followed are quite similar to those used in the 300 cu. in. Packard engine using overhead camshaft and valves. These cars have four speed gearsets and plate clutches and will probably be the only sixes in the race.

The Packard rear axle has an aluminum center housing with forged steel, tubular extensions. The foot brakes are located on the rear axle and the hand brake on the

propeller shaft, front wheel brakes having been considered unnecessary for this race. The gear ratio and tire sizes are yet to be definitely settled. The fuel tank is said to have sufficient capacity, so that only one stop for re-fueling will be required during the 500-mile race.

The springs are understood to be of the semi-elliptic type, but to be without shackles. The rear end of the rear spring is pivoted to the rear cross frame member and is arranged to slide through a slotted member at its front end.

Duesenberg

The Duesenberg chassis will be fitted with eight in line engines as were last year's chassis. They have 2 3/8 in. bore and 3 27/64 in. stroke. The removable cylinder head carries two overhead camshafts which actuate four valves (of 1 1/16 in. diameter) per cylinder. The valve mechanism is a direct acting type, with cams bearing directly on the valve without interposed rocker arms. The vertical shafts, used to drive the camshaft on the 183 in. 24-valve racing engine, has given place to a train of spur gears mounted on ball bearings.

The eight cylinders are cast in a single block of aluminum alloy with inserted cast iron sleeves. Connecting rods are tubular and carry aluminum pistons with rings 3/32 in. wide.

It is understood that one or two of the Duesenberg entries will have three bearings, while the other one or two will have five bearing shafts. These shafts are made in one piece and in both types the end bearings are of the ball type while the inner or center bearings are straight roller type. With this construction a split, hardened race is employed. One-half is doweled into the cylinder block casting and the other into a removable cap. The inner raceway is directly on the shaft which is case hardened on that part of the journal upon which the rollers bear.

The frame side rails of the Duesenberg chassis are made of heat treated duralumin and have a depth of 6 in. They are said to weigh only 15 lbs. each. They are formed by hand from 1/8 in. stock, and are stiffened by laminated wood which fills the channel between top and bottom flanges. The frame is 20 in. wide and it fitted with a body accommodating only the driver. A portion of the tail piece serves as a container for the gasoline supply.

Front and rear axles are of Duesenberg design and are built in the Duesenberg shop. The tubular front axle, with two-arm steering knuckles, is retained. Rubber shock insulators are used in place of spring shackles on the half elliptic springs. These insulators are housed within an aluminum streamline casting which is bolted to the side rails of the frame.

Information concerning the Durant, H. C. S. and the

Miller specials, which are understood to be the product of the same shop, is decidedly limited, but it is presumed that these cars will be similar in many respects to those produced by Miller last year.

Photographs of the Miller engine, which in an eight-cylinder 2 11/16 x 3 1/2 in. unit said to weigh just over 300 lb., show it to have a box shaped crankcase, a block cylinder casting, and two overhead camshafts, arranged to operate two valves per cylinder.

Miller

Four double carbureters with single float chambers, double jets and intake pipe only a few inches above the ground are employed. Connecting-rods have plain bearings at the lower end and are of tubular pattern. Pistons are of aluminum alloy. One spark plug is placed in center of head and the combustion chamber is approximately spherical. The crankshaft is a five-bearing type. Four bearings are plain and one is a ball bearing. 100 lb. oil pressure is employed. In common with several of the other cars in this race the engine is said to be capable of speeds of from 4500 to 5000 r. p. m.

Miller chassis are understood to have 100 in. wheelbase, and 52 in. tread. The frame width is 21 in. and the body is said to be only 18 in. wide. No brakes are used on the rear wheels, but front wheel brakes, probably in combination with brakes on the propeller shaft, are employed. It is reported that 30 x 5 in. tires on disk wheels will be used on rear and 29 x 4 1/2 in. on front.

The usual provisions for reducing wind resistance have been made. This year's cars are said to have 720 sq. in. projected area as against 874 sq. in. in the case of the cars fitted with 183 cu. in. engines last year. The cars are said to weigh slightly over 1400 lb. and 30 gal. of fuel and 6 gal. of oil are carried.

The steering gear is centrally mounted, and the wheel is cut away over the lower third of the quadrant, in order to give more clearance to the driver's legs. The driver straddles the gearshift and hand brake levers which are centrally located.

Car No. 17 in the entry list, which is simply designated "special" and is to be driven by Frank Elliott, is also understood to be a Miller product, although it may differ in some particulars from other cars of the same make. Details in this regard are not as yet available.

Four of the eleven Miller built cars are reported to be reconstructed from 183 cu. in. engined chassis used last year.

It has just been announced that two of the cars built in the Miller shop and heretofore appearing in the entry list as Miller specials, are owned and sponsored by the H. C. S. Motor Co. of Indianapolis, and will be known as H. C. S. specials. One of these cars is to be driven by Milton.

Scheel-Frontenac

Among the other prominent American entries are the four Scheel-Frontenacs, which are quite similar except for the valve mechanism and cylinder head to the Frontenac racing cars used in last year's race. These cars are fitted with four-cylinder engines, having two rotary valves which run the length of the cylinder block and govern both the inlet and exhaust on all four cylinders. These cars are reported to be the design of Herbert Scheel and Louis Chevrolet, who has been responsible for the earlier Frontenac designs.

A detailed description and drawing of the engine used in these chassis will be found on the following pages.

Of the remaining three American entries, one, known as the F. H. W. special, is said to incorporate a novel high

speed valve operating mechanism, developed by F. H. Wells, a young engineer, who is understood to have designed and developed the car he will drive in the race.

At least one of the other two entries, the Barber-Warnock special, is a revamped Ford chassis, said to incorporate about 75 per cent of Ford parts. The displacement of the engine has been brought within the required limits, by utilizing the Ford cylinder block with 5/8 in. inserted sleeves. A special eight-valve head of Frontenac design is employed. Other changes include a revised steering system, higher gear ratio and special carbureter. The Ford parts are understood to include, beside the cylinder block, the frame, front and rear axle, gearset, fly-wheel, connecting rod, camshaft, bearings, and other minor parts.

Information concerning the remaining American entry, known as the Clements special, built by Clements & Milner, of Indianapolis, is lacking.

Foreign entries this year include five Bugatti cars, the product of an Alsatian builder who makes a specialty of sport type chassis construction. The Bugatti chassis are fitted with eight-cylinder engines of 60 m.m. bore and 88 mm. stroke, and are said to develop over 100 hp. at about 5000 r.p.m. A description of these chassis, together with photographs showing the type of construction used, are found on following pages.

Rolland-Pilain

The two other French car entries are Rolland-Pilain chassis, one of which is entered under the name of Schmidt special and is fitted with the S.R.O. design of cuff valve. This engine is said to be the design of M. Schmidt, a French engineer connected with the Paul Schmidt Co., builders of aircraft.

Very little is known concerning the remaining three entries, which are Mercedes chassis built by the Daimler Motoren Gesellschaft of Stuttgart, Germany, except that they are fitted with four-cylinder engines and bodies capable of seating driver and mechanic.

It is interesting to note that of the 30 cars concerning which particulars are at hand, 19 will be fitted with eight in line engines, three with six-cylinder engines and eight with four-cylinder powerplants. The eights include the various Miller products, the Duesenberg and the Bugatti. Among the fours are the Scheel-Frontenac, the Mercedes, and the Barber-Warnock entry. So far as is now known, the only sixes are the Packard entries, the performance of which will be observed with great interest.

Bugatti

The five Bugatti entries built by Ettore Bugatti, of Molsheim, Alsace, who specializes in a fast, sporting type 122 cu. in. chassis, are said to be stock models with only such detail modifications as are necessary for the special conditions of the Indianapolis track.

The single seater bodies for these cars are the design of a French aviation engineer, Bechereau, who was responsible, during the war, for the design of Spad scout planes. As no changes of importance could be made in the chassis, the maximum width of the bodies is appreciably greater than that of the majority of American cars. The driver is placed centrally in the chassis, with his eyes just above the level of the scuttle and the top of his head flush with the top of the tail; this part is streamlined with the pilot's head, as in aviation practice.

The engine has a stroke of 88 mm. and its eight cylinders, cast in two blocks of four, are of 60 mm. bore. They are mounted on an aluminum basechamber which is carried directly on the chassis frame members. The cylinder blocks are rectangular, and the timing gear housing at the

forward end is also squared off, giving a box like appearance to the engine. The detachable cylinder head has a lapped face where it joins the cylinder blocks. It carries three vertical valves (two admission and one exhaust) operated by a single overhead camshaft mounted in three ball bearings. Light followers are interposed between the cams and the valves, the two shafts carrying these rockers being hollow and forming an oil duct through which lubricant is delivered directly to the cam faces. Maximum engine speed is 4800 to 5000 r.p.m. and the power developed is declared to be 104 hp.

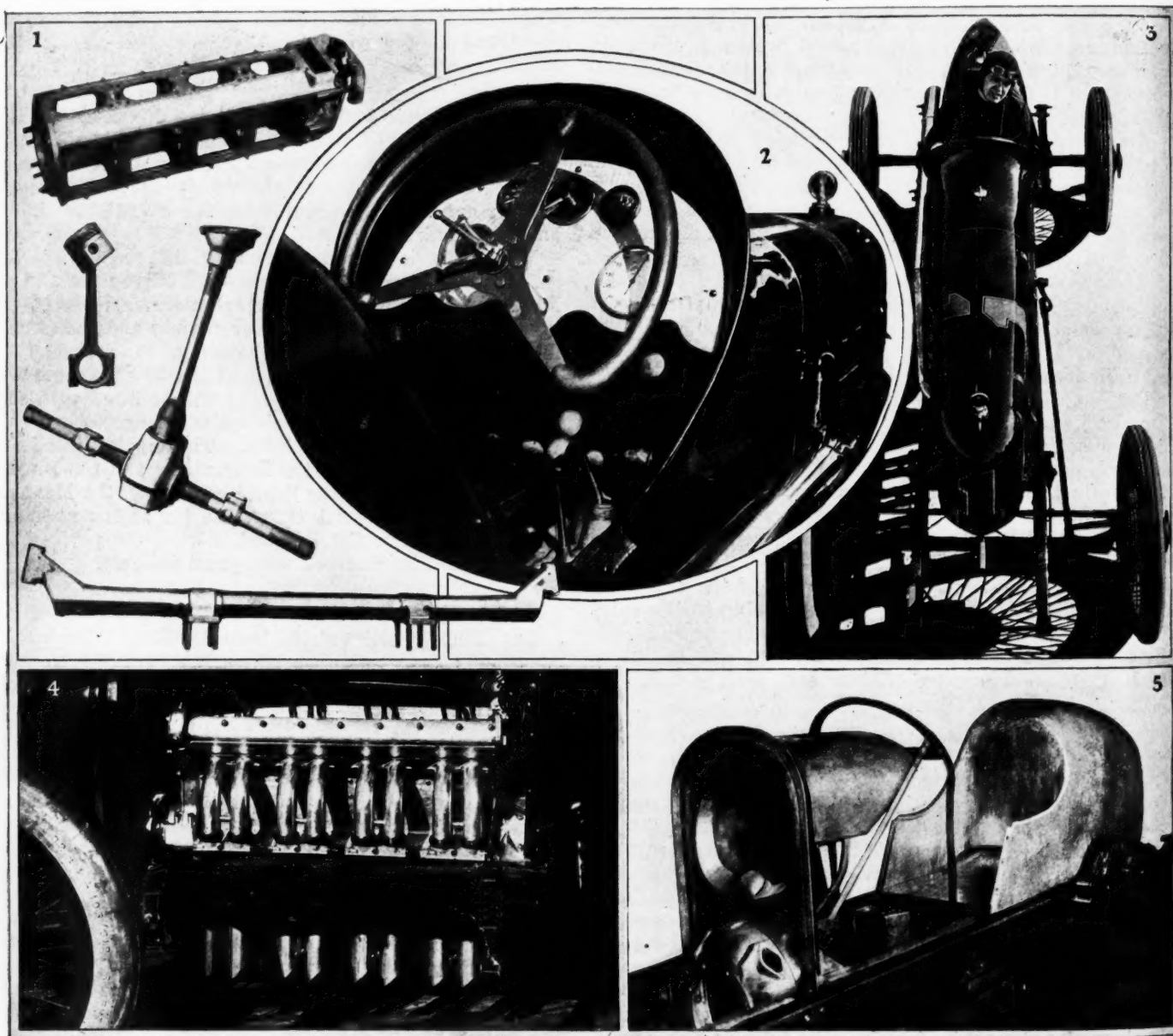
Two-Piece Assembled Crankshaft Used

A two-piece assembled crankshaft, carried in three ball bearings, is employed. I-section white metal connecting rods and aluminum pistons having four narrow steel compression rings are used. Normally the 122 in. Bugattis are fitted with two Zenith carburetors, but it is probable that they will be run at Indianapolis with four carburetors, and that benzol, or a mixture of benzol and gasoline will

be used as fuel. Compression has been raised above normal with a view to the use of benzol. Normally ignition is by a high tension magneto mounted on the aluminum dashboard and driven off the tail end of the overhead camshaft by a fabric universal jointed shaft. In some races, however, use has been made of two magnetos, with external gears, and in others the Marelli combined generator and distributor has been employed. It probably will depend on track tests as to which type is definitely adopted for the race.

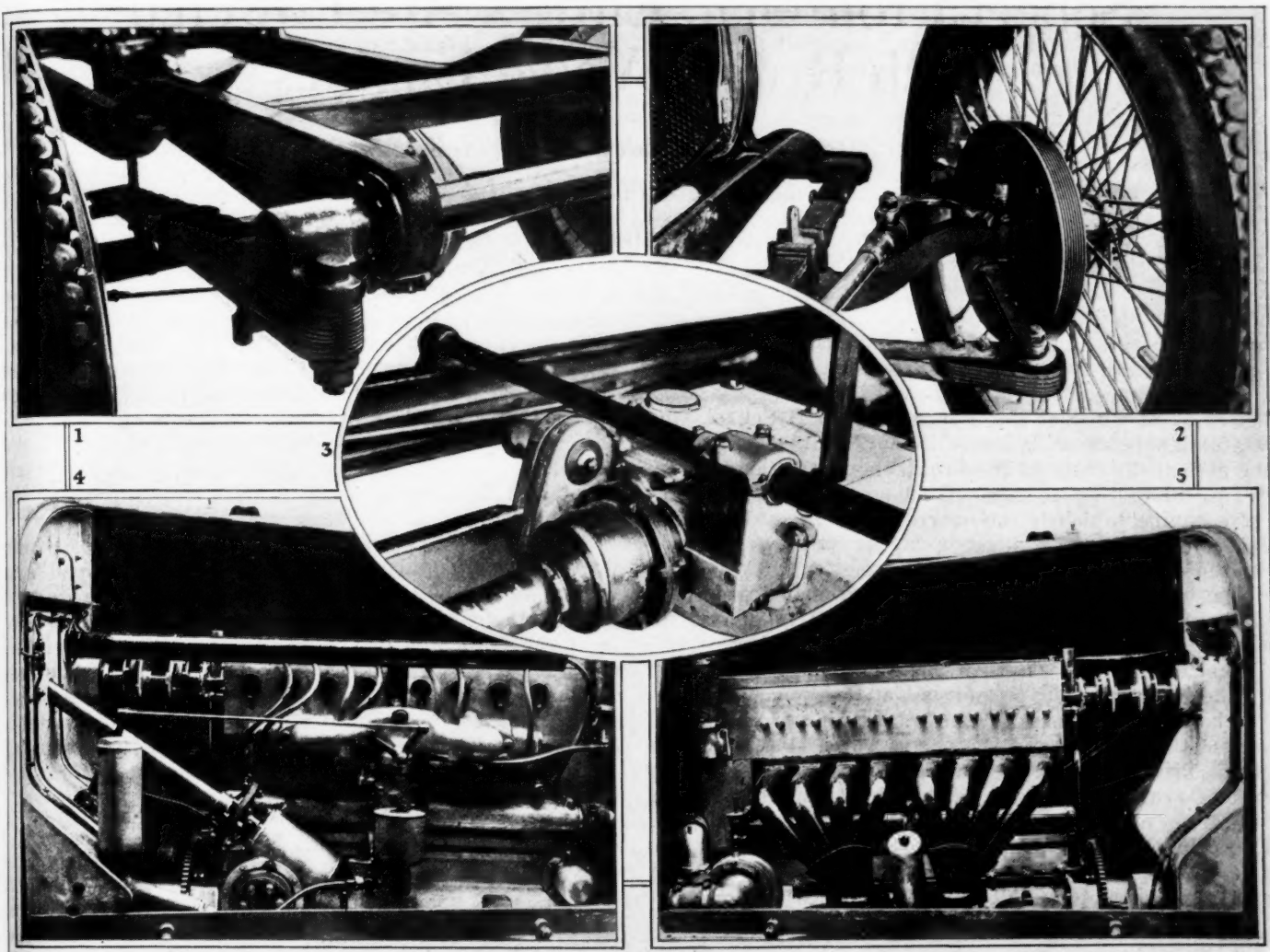
Engine lubrication is assured by means of a gear type pump driven off the right end of a cross shaft, the opposite end of which operates the water circulating pump. The oil is delivered direct to the three main bearings and to collector rings by means of which it is carried centrifugally to the connecting rod bearings. In addition there are direct leads from an external oil pipe on to the crankshaft webs, the oil thus projected being taken up in collector grooves and delivered centrifugally to the connecting rod bearings. Other external leads take the oil to

Miller 122 Cu. In. Eight-in-Line Racing Car



1—Lightweight units of the Miller racing car. 2—Showing centered gearshift and steering wheel cut away to give driver more room. 3—Bird's-eye view of Miller racing car. The wheelbase is 100 in. and the machine weighs slightly over 1400 lb. 4—The eight-in-line, 122 cu. in. engine. 5—Details of body construction

Details of the Bugatti 500-Mile Race Entrants



1—Inverted quarter elliptic spring of Bugatti. 2—Double tubular transverse tie rod with leather extremity carrying ball. 3—Leather link for torque member. 4—Stock model 122 cu. in. engine with single carburetor. Four carbureters will be used in the Indianapolis Race. 5—Exhaust side of engine

the rear end of the rocker arm shafts, the return being by the front housing containing the bevel gears and vertical shaft driving the overhead camshaft. There is also a direct oil lead to the steering gearbox. All the oil is contained in an aluminum casting bolted to the basechamber and fitted with longitudinal copper tubes, open at both ends, for cooling purposes.

Separate Four-Speed Gearbox

A multiple disk clutch is used. The four speed gearbox is separate from the engine and is carried on the frame members. The mounting is not direct, for there is an L-section member bolted inside the channel of the frame, to which the box is hung. Drive is by open propeller shaft with two metallic joints to the bevel gear rear axle, the housing of which is formed of two taper tubes machined from the billet, and a central aluminum casting split vertically. Rear springs are of the now well-known Bugatti inverted quarter elliptic type, the thick end of which is attached to the extremity of the chassis, the main leaf being carried forward and secured by an eye bolt to a bracket on the axle housing.

There is a rather unusual use in the Bugatti chassis of leather universals and links. Examples are the channel section pressed steel torque member, which is bolted at the rear to the differential housing and at the front end

is attached by a double leather link and two pins to the rear face of the gearbox.

There is a somewhat similar use of leather for the transverse tie rod. This connection consists of two steel tubes with flattened ends attached by two bolts to oval-shaped blocks of compressed chrome leather having a top and a bottom plate of steel. A socket is formed in the leather for the usual type of ball, the taper stem of which is mounted in the steering arm in the normal manner. There is also a flexible connection by means of a leather disk, forming universal, between the steering column and the steering worm shaft. With a flexible steel spider for the steering wheel, it is claimed that all vibration is absorbed, and that danger of the fracture of steering gear parts is lessened. Rubber links are also used for connection between friction type shock absorbers and axle.

Front and Rear Brakes

Brakes are fitted on both the front and rear wheels, the former being of the hydraulic type, applied by the pedal, and the latter, of very much bigger diameter, being hand operated. There is no brake on the gearset. The French cars will be run in the race with American straight side tires, of either 28 by 4 or 29 by 4½ in. size. The wheelbase is 94 in., track 47 in., width of frame 27.5 in. and weight without supplies aboard is given as 1433 pounds.

Scheel-Frontenac Entries Are Powered with Rotary Valve Engines

Four-cylinder stock design adapted to deliver 100 hp. at 5000 r.p.m. Each valve controls both inlet and exhaust. Provision for disengaging countershaft when running in high gear.

FOUR cars entered under the name of Scheel-Frontenac are to be driven in the 500-mile Indianapolis race. There is embodied in these chassis a power plant which is the design of Herbert Scheel, who has collaborated with Louis Chevrolet in constructing the cars at the plant of the Frontenac Motor Co.

The interesting feature of the chassis is the rotary valve engine, which is the outgrowth of the stock Scheel engine, adapted to produce a higher power output by certain changes suggested by Chevrolet.

The engine is a four-cylinder, water-cooled type of 3 in. bore and 4 5/16 in. stroke, designed to deliver an approximate maximum of 100 hp. at 5000 r.p.m.

The semi-steel block casting is similar in construction to the four-cylinder poppet valve Frontenac engines. The housings and seats for the two valves are an integral part of the head. As in the poppet valve Frontenac, the crankshaft is carried in the lower part of the cylinder casting which forms what might be termed the upper half of the crankcase. The crankcase structure is formed by bolting to extensions on the cylinder casting, the two side plates, and lower plate, which form a housing either side of which can be removed for inspection without disturbing the opposite side plate.

Thermo-Syphon Cooling Used

The coring of the block has been done with the intention of using thermo-syphon cooling, and from what could be seen of the construction the water passages are quite free from pockets. Two cast aluminum plates, fastened with fillister head screws, form the outer walls of the cylinder block. These plates run the full length of the casting and a water header with two branches is fitted to each plate. A water outlet communicating with the water jacketed valve seat housing is provided on each side at the top, between the second and third cylinders.

The spark plugs are located directly in line with the cylinder axes, but the intervening space between the top of the combustion chamber and the water jacket outer

wall is left open at the point where the plugs are located. One of the machine operations on the casting is to bore through jacket and head. The resulting hole is tapped to take a bronze bushing, into which the spark plug is screwed. A water-tight joint is formed at the flanged top of this bushing by an annular copper gasket interposed between the shoulder on the upper part of the bushing and the water jacket wall.

The valve seats are reamed and then ground to within 0.005 in. of finish size, the final finish being lapped with a dummy valve. In order to equalize clearance and balance the compression the small end of the right valve is at the front end of the engine and the small end of the left valve is at the rear. The bore of the valve seat at maximum diameter is 0.365 in. larger than at the small end, and the combined area of the two inlet ports is 3 3/8 sq. in. The cylinder casting receives three annealing operations before the final machining operations are completed.

Five-Gear Train Drives Valves

The five-gear train for driving the two valves, oil pump and ignition unit is journaled on ball bearings at the front end of the cylinder casting. Stub extensions, held into a counterbored recess by stud and nut, carry the annular bearings, which are pressed into the hubs of the gears. The gear directly above the crankshaft pinion carries an extension which drives the double oil pump, one side of which acts as a scavenger to maintain a dry sump.

Above the oil pump drive gear there is mounted the third gear of the train, which meshes with the gears of a separately mounted countershaft, giving a double reduction for the ignition unit. A four-armed spider housing bolted to the front end of the casting carries the gear that drives the fourth gear of the train. The countershaft gear shaft passes through the hub of the spider mounted gear and the outer end is equipped with a bevel gear which drives the ignition unit at one-quarter engine speed. The oil pump and ignition unit are the only units mounted on the gearcase cover, and either can be removed without disturbing the valve drive. The same holds true of the gearcase cover proper.

Four-Point Suspension Employed

Four-point suspension, using cross tubes through the cylinder casting is utilized. The suspension on the Scheel-Frontenac is identical in detail with the system used on the poppet valve Frontenac engine.

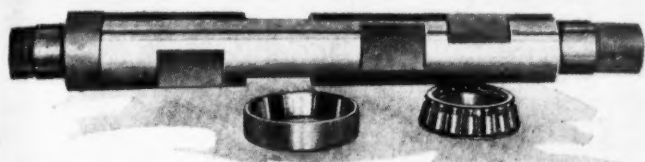
The valves are semi-steel castings, having the same physical properties as the cylinder casting, and they, like the cylinder casting, receive three annealing operations before the final fitting. The ports are milled and are of such dimensions as to permit of a dwell of 220



The first of the Scheel-Frontenac racing cars

deg. on the inlet and 230 deg. on the exhaust. Neither the charge nor the exhaust gas enters the inside bore of the valve, which is a $\frac{5}{8}$ in. hole through its length. Both ends of the valve are threaded and provided with shoulders upon which are mounted annular ball bearings. These bearings are a floating fit on the valves, and on the large end of each valve there is placed a coil spring which exerts a pressure of about 50 lb., tending to force the valve toward the small end of its seat. The valve housing end plate backs up the bearing and takes the spring reaction.

Opposing the pressure of the coil spring, there is mounted at the small end of the valve a ball thrust bearing carried in a threaded housing. A fine pitch thread gives a micrometer adjustment for the valve to valve-seat clearance. Both valves are driven from the



Rotary valve used in the stock Scheel engine. Those used in the racing engine are similar in design, but are mounted on ball bearings

front end, but because of the reverse arrangement the clearance adjustment on the right valve is at the rear while the left valve has the clearance adjustment at the front end directly behind the valve gear and housed within the gearcase cover. In addition to the external thread on each end, one end of each valve is threaded internally to accommodate the valve drive gear retaining screw. Instead of the conventional flange and bolt spigot mounting, the valve drive gear hub has 60 serrations which mesh with corresponding serrations cut in the end face of the valve, thus enabling a fine timing adjustment. The gear retaining screw is locked in position with a star type lock washer. The valves tune at one-quarter crankshaft speed because of the fact that each valve has two port openings for each cylinder. The port positions in the valves are so located that they give an overlap in the time of opening of the inlet and closing of the exhaust of 10 deg.

Carbureter Equipment Undecided

A space over each valve housing is milled flat, and as the inlet passages to the combustion chamber are above the valve, the inlet header for each set of valves is mounted on top. Six studs serve to anchor the brass and copper manifold. The latter is in the form of a loop, which, it is claimed, prevents surging and causes the gas to move always in the same direction. Only two carbureters are used in the design shown herewith, but the designers intend to use either four $1\frac{1}{4}$ in. or eight 1 in. carbureters on the engines to be employed in the race.

The compression ratio is $7\frac{1}{2}$ to 1, which will, of course, necessitate the use of doped fuel.

The crankshaft is machined from a billet of $5\frac{1}{2}$ per cent nickel steel and is finished all over. There are three main bearings, the front being No. 311 New Departure and the rear, which takes the thrust loads, a No. 312. The center main bearing is of the roller type with 18 straight rollers without separators. The race for the rollers is made in two pieces and is ground after being split. One half is doweled into the block casting and the other half into the removable cap. The center main bearing journal, as well as the crankpins, are case hard-

ened, to provide a suitable surface for the rollers which ride directly on the crankshaft at these points.

The shaft measures 29.5 in. overall and is not counter-weighted, although provision is made on the crank cheek to permit of attaching counterweights. About one-third of the width of each crankpin is used as a surface for the connecting-rod big end bearing. The pins are machined to a diameter at the center of about $\frac{1}{16}$ in. less than the largest diameter of the pin. The width of this cut is sufficient to allow the installation of the straight rollers, which are $\frac{5}{8}$ in. long. This construction eliminates the necessity of a retainer.

Aluminum Alloy Pistons Used

The big end of the tubular connecting-rods is milled out to a depth of a little more than half the diameter of the rollers and the cap is doweled and bolted to the rod. The rod big end has no removable raceway. It is hardened and ground with the cap bolted in place. The milling operation leaves sufficient stock on each side of rod and cap to retain the rollers endways. No separator is used between rollers, and on both the center main and the rod bearings the rollers are inserted by removing the bearing cap.

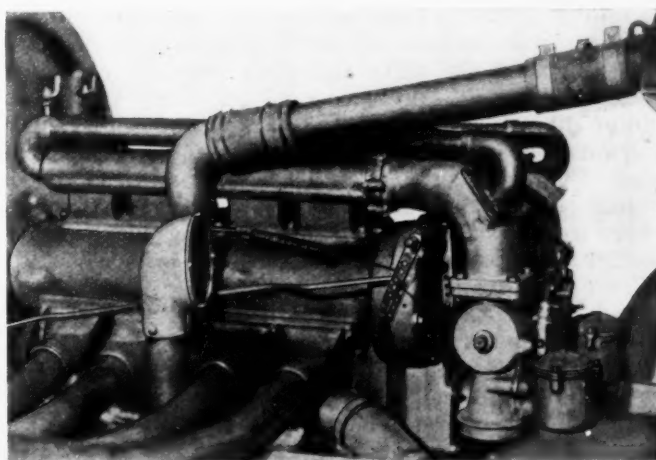
The upper end of the rods, which are 8 in. long, is bushed for the floating piston pin, which is retained by spring rings let into grooves at each end of the piston bosses.

The rear end of the crankshaft is machined to a taper and keyed to the $12\frac{3}{4}$ in. flywheel. The hub of the flywheel rides in a felt oil retainer ring in the end of the block casting.

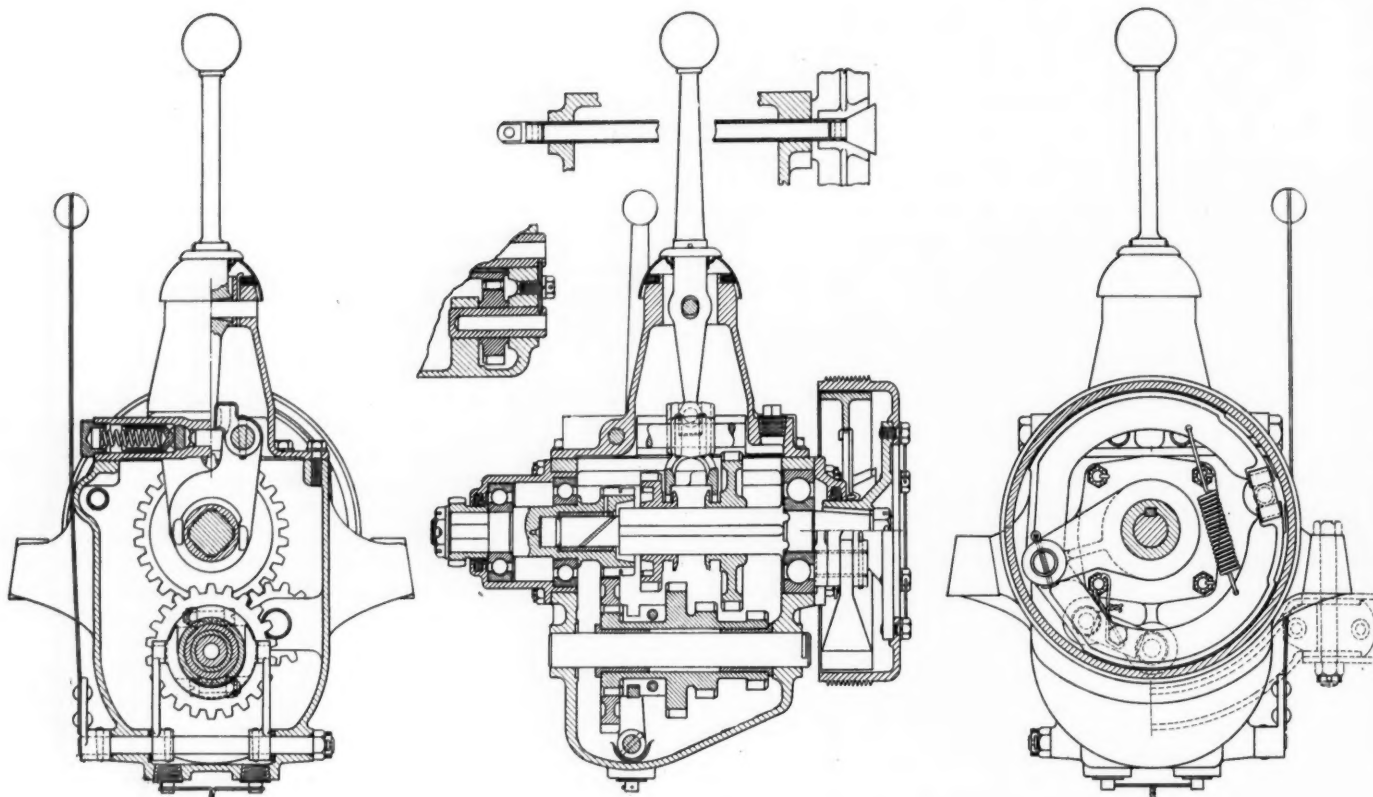
The pistons are an aluminum alloy called "Bunite," manufactured by the Butler Co., and carry three $\frac{3}{32}$ in. cast-iron piston rings of conventional design, all mounted above the piston pin. The heads are convex and are about $\frac{5}{16}$ in. thick.

Crankshaft Not Drilled

Oil is drawn from an external tank by the front set of gears of the circulating pump just above the crankshaft. From the discharge side of the pump the oil enters a strainer mounted just below the pump. The outlet side of this screen strainer is connected to an externally anchored distributing pipe on the right crankcase side plate. There are four holes in this die plate, each directly in line with the connecting-rod bearing when the crank is at bottom center position. A trunnion block type of fitting at each hole carries a tubing jet 3 in. long, which discharges oil continuously. The crankshaft



External view of Scheel-Frontenac racing engine. Another arrangement of carbureters may be used in the race



Three-speed gearset and brake used on Scheel-Frontenac racer. The second shifter lever is used to throw the countershaft gears out of mesh when the drive is direct

is not drilled and the main bearings receive their lubrication from the oil mist in the crank chamber. The oil distributor pipe is extended across the bottom of the crankcase at the rear and up to the valve housings.

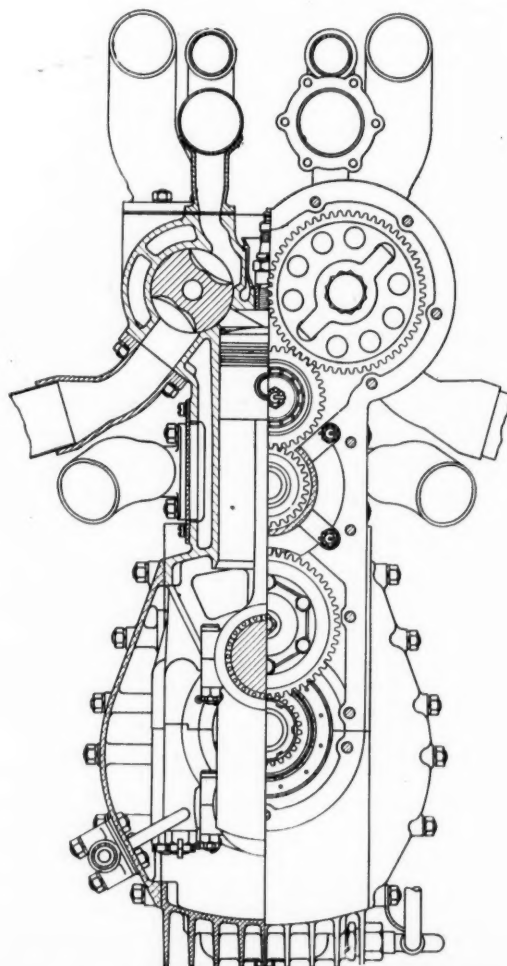
The oil is delivered to each valve at a pressure of 5 lb. The oil inlet is at the rear end of the right valve housing cover. An oil chamber in the end plate is connected to the end plate on the opposite valve housing by a flared joint copper tube. Oil enters the inside of each hollow valve through beveled extensions on each end plate which mate with a corresponding bevel face machined on the inside end of each valve. Although no actual seating occurs between the revolving valve and the stationary beveled extensions the leakage at this point is said to be negligible. Five small holes, one at the end and one between each pair of ports are drilled to conduct the oil to the valve seat. The valve drive-gear retaining screw has a small hole drilled through its length. The diameter of this hole determines the oil pressure in the system and permits the excess oil to pass out the end of the valve and down over the gear train to the crankcase. Any excess oil collecting at the rear end of the valves is conducted back to the crankcase by a drain tube connected to the bottom of the valve housings. The overflow oil from both front and rear of the engine runs to the rear of the bottom crankcase plate, where it enters a strainer communicating with the inlet side or the scavenger pump.

Oil Pressure Maintained at 5 Lb.

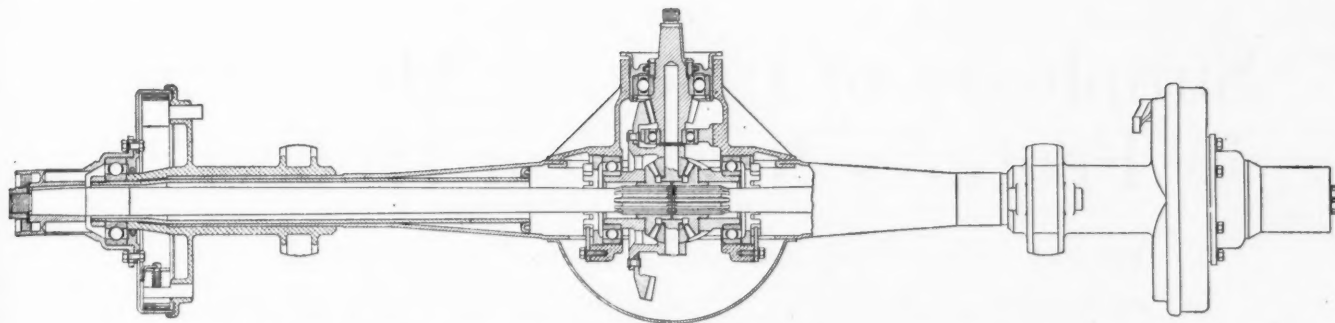
The pistons and pins are lubricated from the oil thrown from the rod big ends. Pressure throughout the system is maintained at 5 lb. maximum.

The chassis of the Scheel-Frontenac, with the exception of a few refinements in the gearset and the installation of a gearset brake, is practically identical with previous Frontenac design.

The dry-plate clutch shaft carries at its outer end the



Transverse sectional view of Scheel-Frontenac engine



Columbia-built rear axle employed on the Scheel-Frontenac racing chassis

female fitting of the Frontenac alignment joint. The fastening is by taper and key and the rear open end has gear teeth cut internally on its inner circumference. A short shaft with male and female fittings connects the clutch shaft with the male toothed fitting on the end of the gearset shaft.

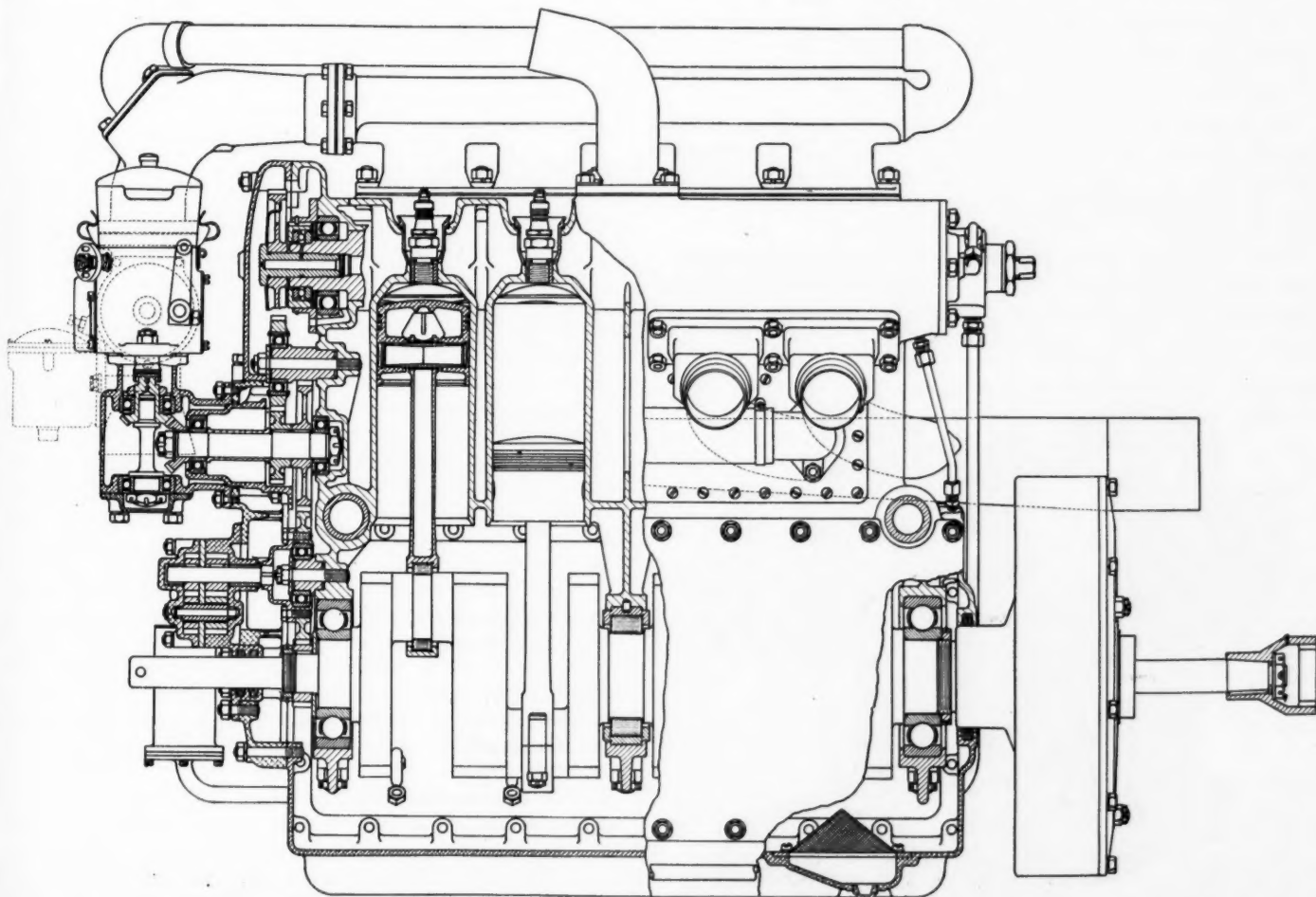
The three-speed gearbox is provided with three-point suspension. The internal construction is conventional in every respect except that provision is made for disengaging the countershaft when running in high gear to avoid power loss in churning the lubricant. An auxiliary shifting lever extends up the right side of the gearset case. The lower end of this lever is pinned to a cross shaft journaled in the bottom of the gearbox case. Two arms pinned on the cross shaft are drilled at their ends and carry the bronze throwout yoke which engages the rear of the front countershaft gear. The countershaft gear assembly is fitted with a short bushing

front and rear, which permit of movement along the stationary shaft. The countershaft gear is moved toward the front by the action of the auxiliary shifting lever in disengaging.

The drum for the gearset brake is spigoted on to the end of the main gearset shaft. This drum is machined from solid stock and carefully balanced. Circumferential webs are machined on the outside to assist in cooling. The internal expanding element is of bronze, which serves as the brake facing. The rear end plate of the gearset has an arm which serves as the brake anchorage. The feature of the brake is the simple pull-rod mechanism with integral cam.

Semi-Floating Rear Axle

The front and rear axles are duplicates of the previous Frontenac racers. The rear axle, a semi-floating type using ball bearings throughout, is a Columbia product.



Longitudinal view of the Scheel-Frontenac 3 x 4 5/16 in. racing engine fitted with two rotary valves. Each valve controls both inlet and exhaust. A 7½ to 1 compression ratio is employed

Simplicity of Indexing Mechanism Features New Gear Hobber

Product of the Cincinnati Gear Cutting Machine Co. permits continuous production of a single design with great accuracy. Cutter head fixed. Work spindle, which is of large size, is carried in base. Allows cutting of 4 diameter pitch teeth.

SIMPLICITY and rigidity are marked characteristics of the gear hobbing machine made by the Cincinnati Gear Cutting Machine Co. These features result, according to the manufacturer, in increased production, a higher standard of accuracy, and lowered maintenance and cutter costs.

The outstanding points of the design are: Extreme simplicity of every detail, in combination with heavy, rigid sections; a fixed cutter head, the work feed being accomplished by a lead screw which telescopes directly into the spindle which carries the gear to be cut; an exceedingly simple indexing mechanism, which involves but two gear contacts and one heavy shaft between the hob and work spindles.

The work spindle is driven by a large spur gear, the diameter of which is several times that of the largest blank that may be cut in the machine. The ratio of inaccuracy resulting from wear in service is thus reduced to a negligible minimum.

Development work on this machine was done in conjunction with one of the large automobile manufacturers with the idea of producing a device particularly adaptable to the requirements of continuous production of a single design.

The machine is of very substantial construction, the two chief components being the body or base in which the work spindle is carried, and the hob spindle housing which carries the complete hobbing spindle with the

combined direct drive worm and flywheel. Both the work arbor and the hob arbor project outwardly over a chip pan in an unobstructed position, making loading and observation easy.

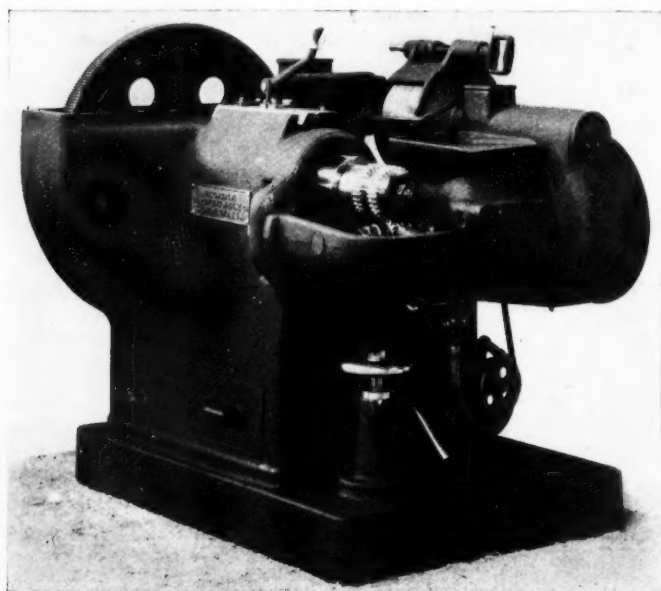
The drive pulley is mounted on a worm shaft, which transmits the drive through an eight-pitch worm to the combined worm gear and flywheel located on the outer end of the hob spindle. The flywheel weighs about 300 lb., and because of its direct mounting delivers the full value of its balance and inertia effect at the hob. The hob spindle, which is hardened and ground, is provided with two opposed taper bearings which run in adjustable bronze bushings. An adjustable thrust bearing, which locates the hob spindle in the correct position endwise, makes it possible to adjust either of the taper bushings without affecting the position of the hob. While any reasonable size of hob may be used with this machine, the best results have been obtained with a hob of 2 in. bore and 4 in. outside diameter.

Spindle Bearings Bored in Housing

The spindle bearings are bored directly in the hob spindle housing at the correct angle for a hob of given pitch. When it is desired to cut a different pitch on the same machine, another interchangeable housing with the correct angle may be substituted. Depth of cut or adjustment to varying diameters is regulated by a micrometer jack screw which is located directly under the chip pan. This adjustment rotates the entire spindle housing around the center of the indexing shaft.

Extreme simplicity is shown in the design of the index mechanism. A pair of bevel gears, driven directly from the hob spindle, transmits the motion to the work spindle through a heavy shaft and a single pair of spur gears. This shaft lays parallel with the work spindle, the spur gear on its rear end meshing with the index master gear which is fastened on the rear end of the work spindle. The index master gear is worthy of particular notice because of its relatively great diameter, which is nearly five times that of the largest blank which may be cut in the machine. It follows that any error due to wear or other causes which may develop at the pitch line of the index gear will be reduced at the pitch line of the blank being cut to approximately one-fifth of its original magnitude.

The work spindle, which is $6\frac{3}{4}$ in. diameter, hardened and ground, is lapped into two opposed adjustable bronze bushings, which are tapered on the outside. The great size of both the hob and work spindles and their bearings eliminates any necessity for outer support of either work or hob. A taper socket is provided at the forward end of the work spindle for the work arbor, which is held securely in place by a draw bolt. The spindle is



Cincinnati gear hobbing machine

fed across the hob by its rotation around a lead screw, which is threaded into a nut placed in the rear end. Variations in rate of feed are made by changing lead screws and nuts. After a cut is completed the spindle is returned to the original position by rotating the lead screw.

As the machine is equipped with stops which make rapid traverse possible, the cycle of an operation is the following: After loading, the operator shifts the belt to start the machine. The rapid traverse then brings the blank up to the cutter, a stop cuts out the rapid traverse and starts the correct cutting feed at the lead screw. After the blank has passed over the cutter to completion, the machine automatically stops and the fin-

ished job is removed. The operator then trips the machine again and the rapid traverse returns the spindle to the loading position and then stops for repetition of the cycle.

All feed and driving gears are fully enclosed and run in oil; the bearings for the spindles as well as all others are automatically lubricated. A gear pump provides ample circulation of the cutting lubricant. Any desired changes in hob speed are accomplished by changing the belt speed at the single drive pulley.

The maximum size of work which can be handled in the present machine is 7 in. outside diameter and $4\frac{1}{2}$ in. face. The design is adequate for the cutting of 4 diameter pitch teeth in steel.

Tests Determine Effect of Chromium and Nickel on Cast Iron

IN discussions on cast-iron as used for cylinder castings and other purposes, the term Mayari iron is sometimes met with, and the question has been raised repeatedly as to just what is meant by it. Mayari iron is cast-iron made from ores mined in the Northeastern part of Cuba. These ores contain nickel and chromium, and also titanium in sufficient amounts to attract attention, while the phosphorus and sulphur contents are extremely low. The dried ore contains about 49 per cent of iron, 3 per cent of silica, 1 per cent nickel, 1.5 per cent chromium, 11 per cent alumina, and 13 per cent water.

A series of tests to determine the effect of the presence of chromium and nickel on the physical properties of the cast-iron has been made for the Bethlehem Steel Co. by Dr. Richard Moldenke and a paper on the subject was presented to the American Institute of Mining and Metallurgical Engineers at its San Francisco meeting.

The tests were made upon standard A. S. T. M. testing bars $1\frac{1}{4}$ in. in diameter and 15 in. long and consisted of transverse breaking, deflection, tensile strength and Brinell hardness tests. The following general conclusions are drawn from the results of these tests:

An examination of the curves, arranged according to a regular progression of total carbon percentages, and grouped according to the phosphorus ranges with the silicon content ignored entirely, shows the following:

1. All the curves show that the higher the total carbon, the lower the Brinell numbers, or softer the metal, and vice versa.
2. That whether phosphorus is low, medium, or high, the relative positions of the curves are the same; that is, the element in question evidently has but little effect on the hardness of cast-iron as compared with that of the total carbon content.
3. The nickel-chromium definitely increases hardness with rising percentages. The increase is not large, but it shows that the softer irons may be had with higher total carbon percentages, which in turn can be kept strong enough by holding the graphite down with the low silicon ranges.
4. There would appear a general showing that the conception of hardness in cast-iron and strength must be kept distinctly apart, and that further investigations should be made to get more information on this subject. The foundryman occasionally turning out gray-iron castings with chilled surfaces is not interested in strength as much as the maker of chilled rolls.

The tests just referred to were made on a great many different mixtures, one or another of the important elements being varied at a time. Variation of the total carbon limit was accomplished by steel-scrap additions. In carrying out the plans a grand total of 465 tests was made.

The results of all of the tests are arranged in the form of tables and curves and those specially interested in the subject are advised to get a copy of the paper on "The Effect of Nickel-Chromium on Cast Iron" from the Bethlehem Steel Co., which has had it reprinted.

Duco Finish, New du Pont Product

A MOTOR car finish which has been developed for speed and economy of application is the latest product of the laboratories of the E. I. du Pont de Nemours & Company.

Duco Finish, as the product is called, is a pyroxilin-type, quick, air-drying enamel, which can be applied by spraying. The finish can be applied to bodies with but little change in present spraying equipment. Due to the quick-drying qualities of this product the necessity of oven drying after several steps in the finishing process may be eliminated.

The finish obtained by this process, it is stated, will not check or craze in service. It is not affected by heat, sudden changes of temperature or alkaline climatic conditions.

This enamel will adhere to bare metal if the surface is clean, but this method of application is not advised, due to the necessity of filling file marks, etc., incidental to body production. The makers recommend the usual surfacing process of metal primer, glazing and rough stuff, or sanding surfacer, with oven drying for production work. It is claimed that after this point two or three spray coats of Duco Finish are sufficient to give a solid color of sufficient body to permit rubbing to a regular finishing surface. The makers claim that but fifteen minutes air-drying time is required between sprayed coats. The surface can then be manipulated in the usual ways to produce the desired finish, the necessity for the use of rubbing varnish being eliminated.

FOR the International Air Congress, which will be held in London June 25-30 next, a guarantee fund of £3155 has been signed. The principal contributors are the large British aircraft firms and two gasoline refiners, the Shell-Mexican and the British Petroleum Co.

Experiments Develop New Constants in Air Flow Measuring Formulae

Venturi and orifice methods have been revised considerably as result of recent studies. Latter involves use of somewhat simpler apparatus. Consists of tin plate with a circular opening, U-tube, and air receiver. Leakage must be avoided.

By Major Johnstone Taylor

IN any installation designed for the bench testing of carbureters it is necessary to have a means of measuring the air flow. Since the operating conditions of the modern carbureter approach those of the Venturi air meter, the Venturi tube has been found a useful method of measuring the air flow with accuracy. As its general arrangement is now so well known a description is unnecessary, the apparatus usually taking the form of the experimental arrangement shown in Fig. 1.

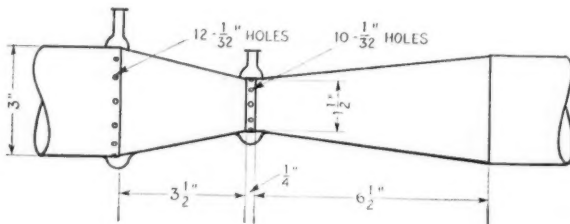


Fig. 1—Experimental set-up for measuring air flow

The general equation for finding Q , the volume of air in cubic feet passed per minute, is as follows:

$$Q = c \frac{3514 a T}{P_s} \sqrt{\frac{n}{(n-1)g} \left(\frac{P}{\sqrt{t}}\right) \left(\frac{p}{P}\right)^{\frac{1}{n}}} \sqrt{\frac{1 - \left(\frac{p}{P}\right)^{\frac{n-1}{n}}}{1 - \left(\frac{a}{A}\right)^2 \left(\frac{p}{P}\right)^{\frac{2}{n}}}}$$

normal atmosphere pressure and a temperature of 32 deg. Fahr. being assured. Of the other quantities

A = area of entry in square feet.

a = area of throat in square feet.

T = absolute temperature of standard air = 492 deg. Fahr.

P_s = absolute pressure of standard air = 14.7 lb. per square inch.

n = constant = 1.402 for air.

g = specific gravity for gas = 1.00 for air.

P = pressure of air at entry.

p = pressure of air at throat.

t = temperature of air at entry.

For practical working this formula can be simplified.

The first part of the equation can be worked out for the particular dimensions under consideration and denoted by K .

The values of $f(p/P)$ can be plotted to a base of values of p/P , giving the curve shown in Fig. 2, which is for values of $(a/A)^2 = 0.01$ and Q found from the equation

$$Q = \frac{c K P}{\sqrt{T}} f\left(\frac{p}{P}\right)$$

In practice $P - p (= \Delta P)$ is the factor which is measured, and the most accurate way of finding the value of p/P is by the equation

$$\frac{p}{P} = \frac{P - \Delta P}{P} = 1 - \frac{\Delta P}{P}$$

The coefficient c , of course, is the all important factor, the accuracy of the calculation depending upon the right value being used for it. With the object of obtaining accurate information on the subject, experiments were recently carried out at Dundee University by Professor Gibson, the apparatus used being shown in Fig. 1.

Professor Gibson's results and those of Professor Rateau are given in the table below:

Value of p/P	0.5	0.6	0.7	0.8	0.9	1.0
Value of c (Gibson)	.994	.980	.972	.958	.940	.911
Value of c (Rateau)	.996	.974	.967	.954	.934	.920

It will be observed that as the ratio of p/P is diminished the value of c increases. The values obtained by Professor Gibson compare closely with those obtained by Professor

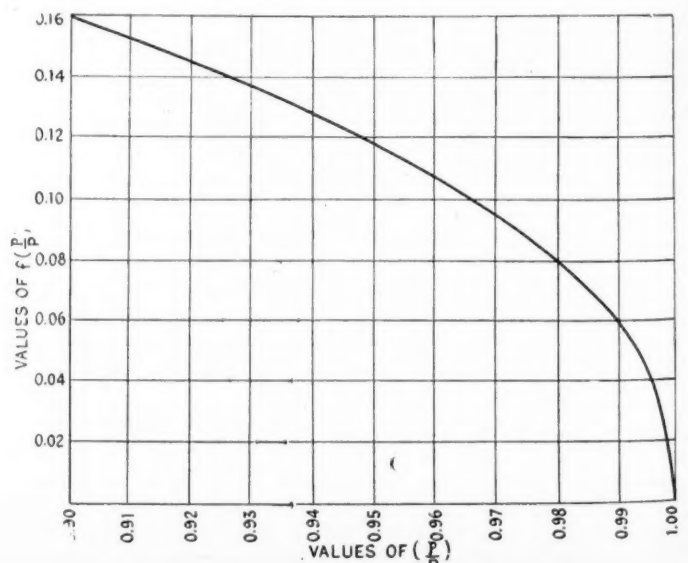


Fig. 2—Curve showing relation between values of $f(p/P)$ and p/P

Rateau on bell-mouthed orifices and straight-sided convergent nozzles. It is thus shown that difference in shape of the up-stream nozzle does not affect the variation of c with p/P . In view of the close agreement between the two sets of figures, they are now generally regarded as quite accurate.

The orifice method involves somewhat simpler apparatus, and in view of its extended use on this account, experiments have been carried out at the British Air Ministry and elsewhere with the object of obtaining accurate information thereon.

Basic Principle for Air Meters

This method is particularly suitable for the measurement of air into or out of a receiver, and is adopted as the basic principle of several compressed air meters. It only requires the simplest equipment. A sheet of tin plate with a square edged circular orifice, a U tube for measuring the pressure over the orifice, and an old oil drum for an air receiver serve the purpose. The apparatus does not require calibrating, because the simple, square-edged orifice can be made without difficulty an exact duplicate of orifices for which the coefficients of discharge have already been determined.

The general equations for the velocity through a plate orifice are

$$V = c \sqrt{\frac{2gh}{P}} \text{ and } Q = cA \sqrt{\frac{2gh}{P}}$$

In engine testing work the rate of air consumption is often wanted in terms of weight, so it can be compared directly with the rate of fuel consumption, and the weight of air passing can be calculated by the formula

$$W = P c A \sqrt{\frac{2gh}{P}} = c A \sqrt{2ghP}$$

taking $c = 0.60$.

It will be found, however, that the weight used per stroke will vary according to atmospheric conditions, and if volumetric efficiencies are deducted directly from the observed weights they will not be the same on different days.

It is often considered preferable, therefore, to calculate the rate of air flowing by volume when it is desired to obtain volumetric efficiencies. The latter, however, when so obtained will be affected by cylinder temperature.

In the following table are given the values of W in grammes per second of dry air for 1 in. difference of pressure, and an air density corresponding to 760 mm. (29.92 in.) of barometric pressure, and a temperature of 15 deg. C. The values, of course, apply only to thin plate orifices.

Diam. of orifice	Value of W
0.375	1.066
0.500	1.899
0.625	2.935
0.750	4.217
0.875	5.723
1.000	7.459
1.125	9.420
1.375	11.620
1.500	14.07
1.625	16.69
1.750	19.57
1.875	22.68
2.000	29.62

By reference to the above table it will be observed that if the values of air in grammes be multiplied by the square

root of the observed difference in pressure the corresponding values for any other difference of pressure can be obtained, assuming that c and P remain constant. The reason why the weights are given in grammes per second is the convenience of the unit, which results from the fact that approximately 1 gramme of air per second per horsepower is required in the average gasoline engine and, in consequence, the approximate horsepower can be gaged by the observed rate of air supply. The value of W in pounds per second is obtained by dividing the value in grammes by 453.5.

When the air supply to an engine is measured in terms of weight the purpose generally in view is the determination of the fuel-air ratio, and for this the actual weight of air used is required irrespective of any inherent moisture.

If the air is not dry the values given must be corrected for saturation. Under average conditions for air half saturated the figures given should be increased by about 6 per cent, to obtain the weight of air and water vapor passing, while if the same value in cubic feet per second is required a constant multiplier of 34.41 should be used.

Density.—The figures given above are for a barometric pressure of 760 mm. and a temperature of 15 deg. C. For other pressures and temperatures the following corrections must be made.

Barometer mm.	Correction, Per cent of air flow	Thermometer deg. C.	Correction, Per cent of air flow
746	— 1	0	+ 2.6
748	— 0.8	3	+ 2.1
751	— 0.6	6	+ 1.6
754	— 0.4	9	+ 1.0
758	— 0.2	12	+ 0.5
763	+ 0.2	18	— 0.5
766	+ 0.4	21	— 1.0
768	+ 0.6	24	— 1.6
772	+ 0.8	27	— 2.1
776	+ 1.0	30	— 2.6

The full correction for temperature, however, must not be applied to an engine running under its own power, because the final temperature of the air measured, reached at the end of the suction stroke, will differ considerably from the initial temperature. Generally atmospheric temperature can be taken as about one-third effective when the engine is hot, showing that at the freezing point, other things being equal, an engine would have an increase of power of some 2½ per cent over normal power at a temperature of 15 deg. C. The full pressure correction, however, may be applied without serious error.

Orifice Plate System of Measuring

With the orifice plate system of air measurement there will be a periodic variation of pressure difference between the two sides of the orifice. The air flow being proportional to the square root of this pressure difference, it is necessary to deduce the mean value of the square root. It is, however, very difficult to determine this mean value accurately, and the now generally adopted method of overcoming the difficulty is to fit an air box between the measuring orifice and the engine suction. Provided this is large enough, pressure variations can be almost damped out. No definite rule as regards the size of box to use has been arrived at, but obviously the size depends on the horsepower, number of cylinders and the r.p.m. An empirical formula for size in cubic feet is as follows:

$$Q = 600 \frac{\text{Hp. to be measured}}{\text{No. of cyls.} \times \text{r.p.m.}}$$

Primarily the size of the orifice should be selected to insure that it results in a difference of pressure that is readable with accuracy. As previously stated, the air consumption of any engine lies in the neighborhood of 1 gramme per second per horsepower. The table previously given gives the rates of flow for a pressure difference of 1 in. of water gage, and for any other pressure the value given in the table requires to be multiplied by the square root of the pressure.

If it should be necessary to use air flows greater than those given for the largest orifices in the table referred to, it is best to use two or more in parallel, their distance apart (center to center) being at least 2.5 times their

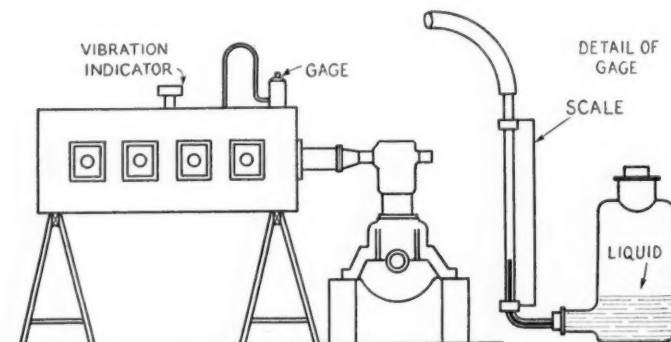


Fig. 3—Layout of apparatus for measuring air flow

diameters, and to arrange the orifices at the side of the box and draw the air from the end. The general arrangement is shown in Fig. 3.

As before stated, an old oil drum will suffice in many cases, but whatever material is used, air tightness is, of course, essential. When the box is made of wood, an air pressure of 12 in. water gage should be provided for. Half-inch boards over a light wood frame, the whole being covered with sheet zinc with soldered joints, will be found a suitable construction. The frame members should be light and so disposed as to not interfere with the air flow. Four and one-half to 5 ft. long by 2 ft. square is a suitable size.

Cutting the holes for the orifices requires care. They should be $1\frac{1}{2}$ in. larger than the largest diameter of orifice used, and beveled off inside, and their number should be the minimum required to give a proper selection of orifices for the work in hand, additional openings merely adding to the risk of leakage. Orifices not in use at the time of a test should be stopped off with soft rubber plugs.

Construction of Orifice Plates

The orifice plates should be cut from material about 0.015 in. thick, tin plate being suitable. They should be 6 in. square and have the holes drilled by clamping between two $\frac{1}{8}$ in. brass plates and then drilling right through the lot; several orifices of one size can be made at a time in this way. Subsequent slight rounding of the edges serves to remove any burrs. They should be bored to plug gages.

Pressure difference may be measured by the ordinary form of water gage or U tube manometer, but in place of water it is preferable to use refined (medicinal) paraffin. The tubes should be of fine bore, from 0.075 to 0.15 in., and they should be graduated, for convenience to read to $1/10$ mm. In order to convert centimeters of oil to inches of water a reduction factor is necessary. This depends upon the oil used and the temperature. For the oil suggested the values are as follows:

Temp. of oil deg. C.	Reduction factor
10	0.3440
15	0.3430
20	0.3418
25	0.3407
30	0.3392
35	0.3380

Leaks.—In order to obtain accurate results all leakage must be avoided. To ascertain that an air box is tight it should be pumped up to a definite pressure with coal gas, and any leak in the box can then be found by passing a flame over its outside. A smoke tester, as used by sanitary engineers for testing drains, would also serve the purpose, as the smoke produced is very dense and is observable in the most attenuated streams. Making these air boxes absolutely air tight is not quite the easy matter it might at first be thought. Even if all the joints are carefully soldered, small leaks occur from time to time, and periodic testing is essential. In fact, as in all other laboratory work, extreme care and attention to the minutest detail are essential to the obtaining of really reliable results.

Nickel-Chromium Steel Tests

ALTHOUGH the properties and peculiarities of the nickel-chromium steels (Ni 2 to 4 per cent, Cr 0.5 to 1 per cent) are fairly well known, and are frequently discussed at the meetings of metallurgical societies, the R. D. Report, No. 55, recently issued by the Research Department, Woolwich, in which the results of extensive research into the whole subject are set out, will be of much value, says *Engineering*. A large part of the information it contains is in tabular form.

The work was carried out on specimens taken from various forgings of low and medium carbon nickel-chromium steels, and also on one type containing molybdenum.

The report points out that some of the steels dealt with, containing from 1.96 per cent to 3 per cent of nickel, and 1.04 to 2.18 per cent of chromium, showing high tensile test figures both when quickly cooled in water and slowly cooled from the tempering temperature, gave average Izod impact figures in foot-lbs. varying as much as from 47, 45 and 56 for the water-cooled specimens, to 3, 2 and 3 respectively for the slowly cooled ones.

Other steels, containing between 1.47 and 2.82 per cent of nickel, and between 0.24 and 0.34 per cent of chromium, gave comparatively low tensile test results, but showed very much more uniformity in the Izod impact figures when water-cooled and cooled slowly.

The report takes the ratio of the impact figures of the quickly cooled steel to that of the slowly cooled after tempering, and finds, for the former variety of steels, ratios varying in extent from 14.2 up to 22.5, and for the latter class of steels ratios varying only from 1.04 to 1.02, these ratios being taken as a measure for the susceptibility of the steels to temper-brittleness.

The most interesting alloy in the series is the one called steel "K" in the report, in which some of the chromium is replaced by molybdenum (Ni up to 2.84 per cent, Cr 0.63 to 0.85 per cent, and Mo 0.43 to 0.70 per cent). This gives good and regular tensile test figures, and was found to be the least susceptible to temper-brittleness; in fact, the Izod impact figure obtained from a specimen after cooling from tempering temperature was practically identical with that obtained from a similar specimen quickly cooled, and this steel, according to the report, "appeared to be quite unsuceptible to temper-brittleness."

Six-Cylinder Bus Engine Developed by Herschell-Spillman

New 452 cu. in. product has seven bearing crankshaft. Other features include full pressure lubrication controlled by interconnection with throttle, camshaft shifter for relief of compression and overhead valves with barrel type guides.

ASIX-CYLINDER engine for sixty passenger bus service has been developed for Mitten-Traylor, Inc., of Philadelphia by the Herschell-Spillman Motor Co. The bore of this engine is 4 in., stroke 6 in. and displacement 452 cu. in. The seven main bearings, overhead valves, complete high pressure lubrication and several unusual features make the engine particularly suitable for this class of service. Among the outstanding features of the design are:

A camshaft shifting device which enables use of exhaust relief cams for starting. The cranking effort is thereby greatly reduced and the necessity for compound gearing on the starting motor eliminated.

An oil pressure regulating valve which is interconnected with the throttle valve on the carburetor and meters the oil supply in proportion to the throttle opening irrespective of motor speed.

An unusual form of valve stem guide bushing with a barrel that incloses the valve spring. This barrel is finished inside and in conjunction with a close fitting cup-shaped spring retainer minimizes oil seepage into the combustion space and lateral wear of valve stems and bushings.

Auxiliary springs on the push-rods, permitting the use of lighter valve springs and thus prolonging the life of valve and valve seats.

Complete pressure lubrication supply to piston pins and rocker arm shaft as well as to the main, rod and camshaft bearings.

The upper half of the crankcase, cylinder block and detachable cylinder head, as well as the timing gear cover, are made of cast iron. The cylinder head cover, valve housing covers, crankcase bottom and oil pan are of cast aluminum. The No. 2 S.A.E. bell housing and timing gear case are formed by extensions of the crankcase and crankcase bottom. The crankcase is parted at the horizontal center line of the crankshaft.

Each Bearing Drilled for Oil Holes

Both main and lower rod bearings are $2\frac{3}{4}$ in. dia. The rod bearings are $2\frac{1}{4}$ in. long. The lengths of main bearings from front to rear are: No. 1, $2\frac{1}{4}$ in., Nos. 2, 3, 5 and 6, $1\frac{3}{8}$ in., No. 4, $1\frac{7}{8}$ in., No. 7, $3\frac{3}{4}$ in. All crankshaft bearing pins are drilled out $\frac{3}{4}$ in. dia. The open ends of these holes are stopped up by means of Hubbard plugs and the holes are connected from end to end by $\frac{1}{4}$ in. oil holes which are drilled in the cheeks of the shaft. Oil holes are drilled to each bearing. All of the bearings on the crankshaft, both main and rod, are of the bronze back babbitt lined type. No shims or oil grooves are used.

The flywheel, upon which a steel starting gear ring is shrunk, is fastened to the crankshaft flange by six $\frac{1}{2}$ in. bolts on a 3 in. radius. An oil-slinger ring with drain

pipe is installed just ahead of the flywheel flange. End thrust is taken at the front main bearing, the crankshaft being equipped with the endwise adjustment which is the usual practice of this company. The crankshaft cheeks are of elliptical section, $\frac{7}{8}$ in. thick and $4\frac{1}{4}$ in. across the widest point. The cheeks are finished on both sides, only the periphery remaining rough. S. A. E. 1045 steel, double heat-treated, is the material specified. Both crankshaft and flywheel are dynamically balanced.

Piston Has Gutter Inside Skirt

Connecting rods measure 12 in. between centers. The I-section is flared at the lower end to form additional support for the bronze-backed bushings. Four $\frac{7}{16}$ -in. bolts attach the lower bearing cap. The upper end of the rod is bronze bushed for the $1\frac{1}{16}$ -in. diameter floating piston pin. This bushing is $1\frac{7}{8}$ in. long. A $\frac{1}{4}$ -in. copper tube is fastened to the web of the rod and pressed into each end bearing to carry oil under high pressure from the lower rod bearing to the piston pin.

The piston pin is $3\frac{1}{2}$ in. long and drilled out $11/16$ in. inside diameter to reduce weight. Snap rings are inserted in grooves in the pin bosses to locate the pin endwise. The cast iron pistons are $5\frac{1}{4}$ in. high, the pin is located $2\frac{1}{4}$ in. from the bottom of the skirt. The piston head is slightly domed. Three $3/16$ in. wide rings are located above the pin and the skirt is slit just below the rings on the sides which take the thrust. An unusual feature of the piston design is a gutter inside the skirt at the very bottom. Any oil which collects in this gutter is led to the pressure side of the piston by means of holes drilled through the skirt.

The combustion chamber, which is entirely within the cylinder head casting, is designed to give a 4:1 compression ratio. The clear diameter of the valves is 2 in. and the lift $\frac{3}{8}$ in. Valve heads of S. A. E. 2330 steel are welded to $7/16$ -in. diameter stems of S. A. E. 1025 steel. The valves are all in line and the seats are water-jacketed clear around. Liberal water spaces at every point in the design are provided to prevent overheating of any part of the combustion chamber wall. A standard $\frac{7}{8}$ -18 spark plug is located, at an angle of about 10 deg. from horizontal in the left side of the head, in the same vertical plane with the intake valve. The intake manifold is cast entirely within the head, with a single opening on the fore and aft center line of the engine. At this point the inlet manifold connects with the combination manifold which is described later. Within the head the passage branches and extends for the full length of the head. The ends are stopped by expansion plugs. An individual exhaust passage of minimum length is provided for each cylinder. Thirty-four $\frac{1}{2}$ -in. studs join the cylinder block and head.

The cylinder head is somewhat higher than is usual, as the side walls are carried up to the level of the rocker arm shaft. This is one of the provisions in the engine for prevention of oil leakage. The construction forms a well for the entire valve mechanism. An aluminum cylinder head cover which is fitted with two combined breather and filler caps is drawn down by two hand nuts.

A single tubular rocker arm shaft of 11/16 in. outside diameter extends from front to rear and is supported by seven brackets which are located in respect to the cylinder axes in a manner similar to the main bearings. The ends of the tube are plugged and oil holes are drilled for each of the rocker arms. Oil is supplied under high pressure by direct line from the pump. The rocker arms and shaft are all hardened. A light spring and two washers are placed between the rocker arms for each cylinder. Adjustable screws with ball-ends which seat in cups on the upper ends of the pushrods are fitted in the outer end of each rocker arm. Locking nuts are provided.

An unusual detail of construction is found in the valve stem guide and spring retainer design. The guide bushing is best described as a conventional type plus an integral barrel which projects upwardly from the usual shoulder which forms the stop when pressed into the cylinder head. This barrel is finished to 1 3/4 in. inside diameter and extends to the top of the valve spring retainer when the valve is closed. The retainer in turn is made from bar stock, with a flat top of 3/16 in. thickness and a thin downwardly projecting hub which fits around the valve stem. At the periphery is a thin downwardly projecting sleeve which is 9/16 in. long and fitted with

very little clearance in the 1 3/4-in. barrel of the valve spring guide bushing. This combination supports the upper end of the valve stem against any side thrust set up by the rocker arms and tends to prevent oil from running down the valve stems with consequent fouling of the combustion chamber.

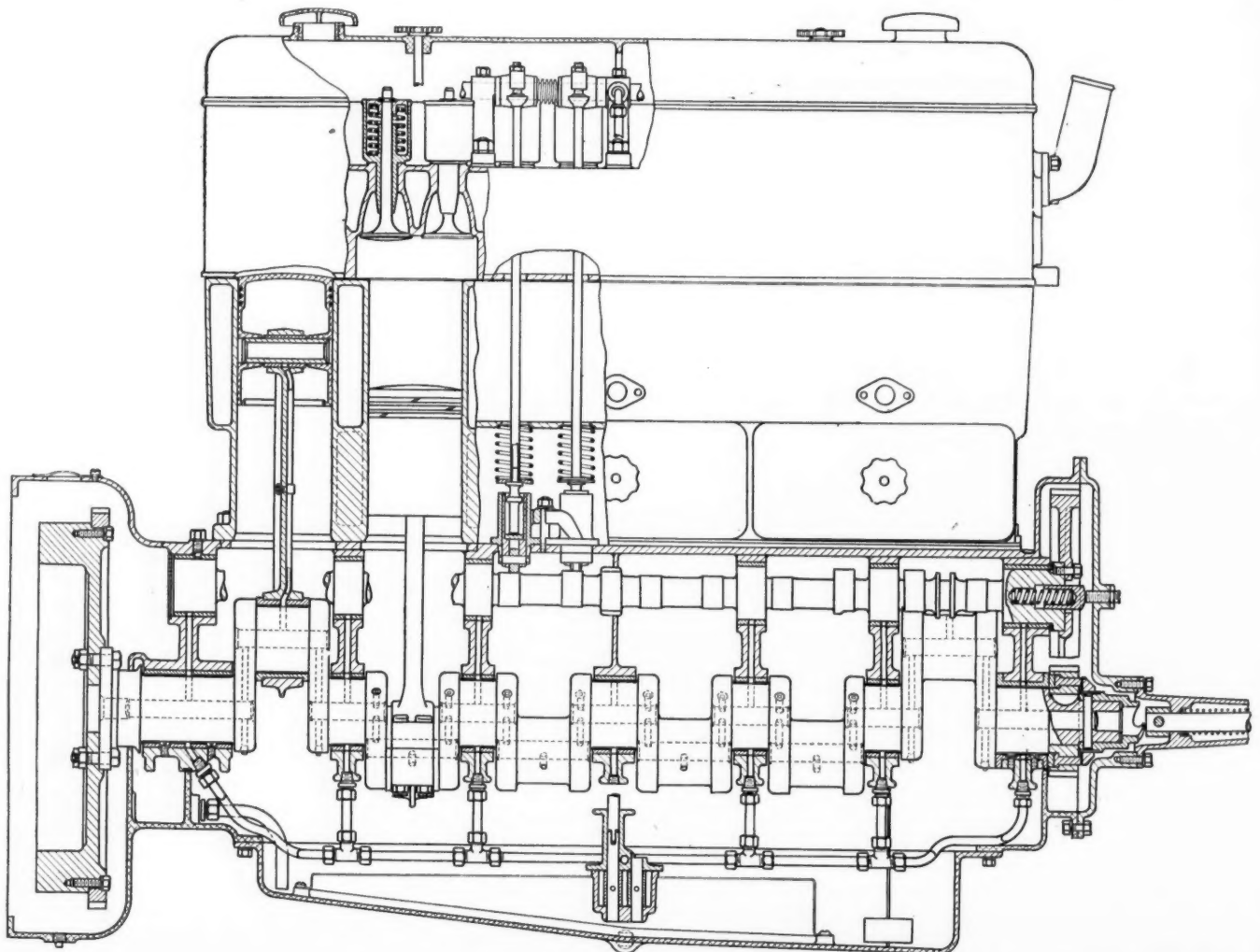
Dual valve springs, 2 1/8 in. shortest working length, are used to eliminate the effect of periodicity at high speeds.

Light weight roller type tappets are carried in cast iron bushings. Each pair of bushings is clamped to the top surface of the crankcase by a stud and drop forged clamp. Pushrods are steel tubing for light weight. A cup is pressed into the upper end and an extension which telescopes into the tappet is pressed into the lower end. Light springs are placed just above and bearing on the lower extension. These springs relieve the valve springs of a great share of the inertia load due to the push rods at high speeds.

The complete tappet and pushrod assembly is inclosed within the cylinder casting by an integral false wall which is symmetrical with the water jacket construction. Large hand holes which are fitted with cast aluminum cover plates are placed at the base of the cylinder casting.

The timing of the engine is conventional with this company. The intake valve opens 8 deg. before top center and closes 45 deg. after bottom center. The exhaust valve opens 45 deg. before bottom center and closes 8 deg. after top center.

The camshaft, which is 1 1/4 in. diameter between bearings, is carried in six cast iron bushings. No bearing is provided in the middle web, as the oil pump drive gear



Longitudinal view of new Herschell-Spillman six-cylinder bus engine

occupies that space. The bearings are all $2\frac{1}{4}$ in. diameter, the length, front, 2 in., rear, $1\frac{13}{16}$ in., and the four middle $1\frac{1}{4}$ in. The drive gear is cast iron of $1\frac{1}{4}$ in. face and is mounted on a flange at the front end of the camshaft. Helical teeth are used.

A novel feature of the camshaft layout is the shifting device which moves the entire assembly forward, thus bringing exhaust-relief cams into operation when starting the engine. The intake cams maintain their regular contour throughout their entire width, which is about double the usual width. Auxiliary cams are formed at the rear end of the exhaust cams to raise the exhaust valves during the compression stroke. The load on the starting motor is thereby reduced and the necessity for a back-gear starting motor eliminated. A level installed on the right side of the engine just back of the timing gearcase serves to shift the shaft. The inner end of the shifter shaft is fitted with an eccentric lug which extends into a groove formed by two flanges on the camshaft. The groove is located approximately on the center line of Cylinder No. 1.

As the camshaft is shifted, special provisions are made to take up end thrust. A spring actuated plug is telescoped into the front end of the camshaft, and in turn bears against a hardened screw which is threaded into the gearcase cover. The flexibility of the spring permits the necessary motion and its pressure plus the rearward thrust of the helical teeth of the camshaft gear returns the shaft to the normal position as soon as the engine is running.

The auxiliary drive is located on the right side of the engine and runs at one and one-half times crankshaft

speed. A flexible coupling which drives the centrifugal water pump shaft is placed on the rear end of a short shaft which carries the drive pinion. This shaft rotates in a bronze bushing. At the rear end of the water-pump shaft another flexible coupling drives the lighting generator. Both water-pump and generator are mounted on pads on the upper half of the crankcase. The ignition head is mounted on the generator. The starting motor is carried in an S. A. E. sleeve mounting in the left side of the S. A. E. No. 2 bell housing. The dimensions of the flywheel in relation to the bell housing conform to S. A. E. standard practice.

A fan drive pulley is located on the front end of the auxiliary shaft. An arm with a set-screw adjustment is mounted on a heavy stud on the front end of the cylinder head to carry the 22-in. diameter 4-blade fan.

Crankcase Inspection Opening

The aluminum crankcase bottom is faced off on the plane of the extreme lower travel of the connecting rods to provide an inspection opening. This opening is closed by the oil pan and is of sufficient area to permit inspection and adjustment of all rod bearings. The oil pan is deepest at the front end and a float is located at this point. The float is placed on a rod which extends upward and forms an oil level indicator at the top of the crankcase between cylinders 1 and 2.

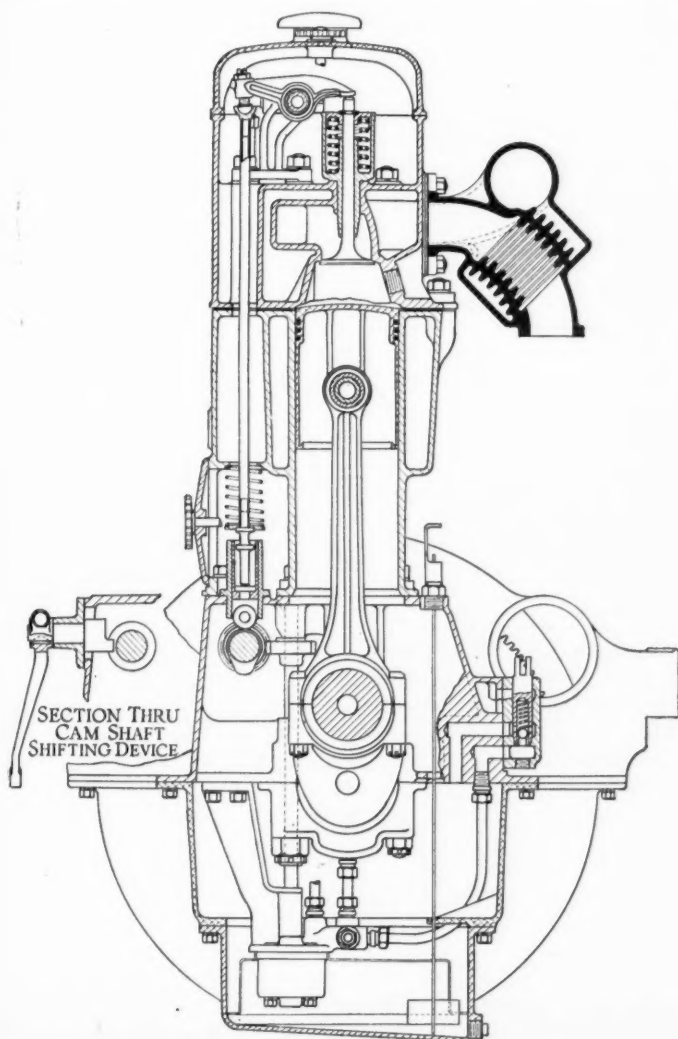
The oil pump is located in the oil pan, opposite center main bearing. The pump bracket is bolted to the lower face of the upper half of the crankcase. The drive is taken from the camshaft through helical gears and a vertical shaft. The base of the gear pump housing is circular and fits tightly into an inverted pressed steel hood which is bolted to the inside surface of the bottom of the oil pan. The strainer screen is fastened to the bottom of the hood, the total area of screen being 168 sq. in.

Pressure throughout the entire system is controlled by an oil pressure regulator which is located on the left wall of the crankcase opposite the center main bearing. This device is connected to the pump outlet by a short length of copper tube. As the pump capacity is designed to be greater than the requirements of the engine, a spring-actuated ball relief valve is placed within the regulator plunger as a safety device. The regulator plunger is connected by a link at its upper end to the carburetor throttle valve. A taper valve of small included angle is machined on the lower end of the plunger. This valve seats directly against the pressure line. As the throttle valve is closed the regulator valve opens, thus decreasing the pressure in the oiling system. When the throttle valve is open for full load requirements, the regulator valve is closed.

Oil is carried to each of the seven main bearing caps through copper tubing, thence to the connecting rod and piston pin bearings through the hollow crankshaft and connecting rod tubes. Holes drilled in the crankcase convey oil to the camshaft bearings. A copper tube placed in the pushrod chamber connects with the rocker arm shaft.

The carburetor elbow is an integral part of the six port exhaust manifold. The exhaust gases pass around an enlarged cylindrical chamber which forms a section of the intake elbow. Annular fins are cast on both the inner and outer surfaces of the chamber. The inside diameter of the inner fins is $1\frac{11}{16}$ in., which is the same as the outlet of a standard $1\frac{1}{2}$ in. carburetor. The heating chamber is placed at an angle of 45 deg. and a vertical carburetor is used. This arrangement involves no decrease in the net area of the intake manifold.

The timing gear case cover is fitted with a barrel extension for the front support of a three point engine suspension. Ahead of this is bolted a cylindrical extension which carries the starting crankshaft.



Transverse sectional view of Herschell-Spillman bus engine

Punch Presses Now Used Extensively in Manufacture of Bushings

Type composed of steel shell with rolled and stamped bronze liner produced in large quantities. Bore completely finished in one or two broaching operations. Outside diameter machined on centerless grinder. Only standard types of tools are used.

By Herbert Chase

SINCE the output of bronze bushings for automotive purposes amounts annually in this country to several millions, it is natural that the production of these units should be carefully investigated in order that their costs may be reduced to a minimum. Among the concerns which have given this subject many years of practical study is the American Bronze Corp. New methods of bushing manufacture developed by this company have greatly decreased first cost through numerous savings in material and labor.

While the company in question continues to make large quantities of cast bronze bushings, a very considerable part of its present output is in so-called armored bushings which are composed of a hard rolled bronze liner pressed into a steel tube or shell. Up to the present time, the use of this type of bushing has been confined to spring shackle and spring eye applications where absolute concentricity of inner and outer diameters is not essential. It is possible, however, to manufacture the bushing with eccentricity limits as close as with other types of bushings and it is believed that this type of bushing will shortly find other applications.

The shell is made from a hard drawn steel tubing of 15 to 20 point carbon content. This is purchased from the tubing manufacturer with the inside diameter tolerance held to ± 0.002 in. The wall thickness of the steel tube in all sizes of this bushing thus far made is $3/32$ in.

The liner is formed from cold rolled bronze, containing a high percentage of copper and having a hardness of 30 scleroscope with thickness limits from 0.0345 to 0.0365 in. This material comes in strips, slightly wider than the length of the finished bushing.

In the process of manufacture the first operation on the steel tubing is to cut it off to rough length in an automatic screw machine. In the second operation the ends of the shell are chamfered to about a 45 deg. angle on the inside diameter to a depth of about $1/8$ in., no special

care being required to secure uniform depth of cut. This operation is performed on a high-speed drill press with the bushing held in a quick-acting clamp. It is chamfered first at one end and then at the other end, after which it is delivered to a punch press for insertion of the lining. The chamfer facilitates insertion of the liner and is later used as a means for locking the liner against axial motion.

The first operation on the bronze lining is to cut off the strips to a length equal to the mean circumference of the liner when the latter is pressed in place. This length is held to ± 0.0025 in. The strip is fed by hand against a stop, the cutting off operation being performed on a Bliss press.

Forming Liner in Punch Press

The second operation on the bronze liner is to form it in a punch press to a U-shape section, using dies of very simple construction. The U-shaped pieces are then formed into approximately tubular shape, under a second ram on the same press as that on which the first forming operation takes place. During the second forming the stamping is held in a die which closes the ends of the U-shaped section over a mandrel. The die has two hinged portions, as shown diagrammatically in Fig. 1, which close around the mandrel and give the liner its tubular form. At the end of this operation the opening in the bushing varies from approximately 0 up to about $1/8$ in. Waterbury-Farrell presses are used for these operations.

In the sixth operation the bronze liner is inserted in the steel sleeve. This is accomplished on a Bliss punch press without the aid of any fixtures. The steel sleeve is simply set on top of the bronze liner, Fig. 2. When pressure is applied the liner slips readily into the chamfered sleeve. It has been found by experiment to be easier to accomplish this operation in the manner indicated, rather than to use a special jig or other guiding means.

It is now desirable to lock the bronze sleeve inside the steel shell and this is done by a punch press operation in which the bushing is held between two tapered end punches. This operation, Fig. 3, expands the ends of the bronze lining into the chamfers previously cut in the ends of the inside diameter of the steel sleeve. A small Bliss punch press is used.

The assembled bushing is now ready for finishing of the bore, which is accomplished by a single broaching operation on a Bliss or Toledo press. The two final lands on the broach are rounded so that they burnish the bore of the bushing rather than cut. This results in a hard surface with a mirror like finish. The bore in this type of bearing is held to ± 0.0005 in. The coolant employed is known as Richard's cutting compound. Plug gages are used to check the accuracy of the bore.

Following the broaching operation, the bushings are

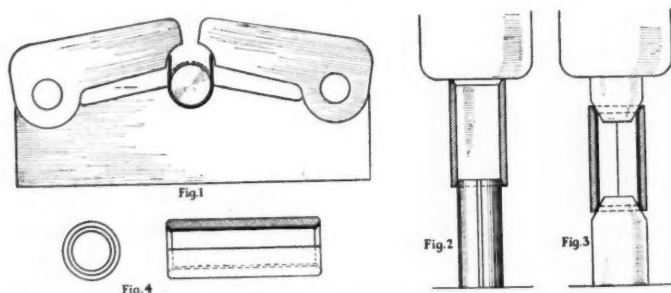


Fig. 1—Hinged portions of die. 2—Pressing liner into steel sleeve. 3—Locking sleeve to liner by expanding ends of liner. 4—Chamfering edges for end facing

delivered to simple lathes for end facing. During this operation the work is held on an expanding air chuck. The limits employed are usually ± 0.010 in., but, on special work, limits of 0.0025 in. can be held if desired.

In the end facing of standard armored bushings, inside and outside edges are chamfered as shown in the accompanying drawing, Fig. 4, but, if customer desires, the outside edge is left square and the inside edge with little chamfer.

The final machining operation is an outside grinding on a No. 4 Detroit heavy duty centerless grinder. The bushings are given two passes through the grinder and are held to an outside diameter of ± 0.0005 in.

Bushings Checked on Dial Gages

After completion of the grinding operation, the bushings go to the inspection department, where they are checked on dial gages for outside diameter and length.

As indicated above, these bushings are not guaranteed against eccentricity, but the inside and outside walls are guaranteed to be parallel within 0.003 in. as checked on the wall thickness from end to end of the bushing.

The American Bronze Corp. operates its own foundry for the manufacture of cast bronze bushings. Virgin metals plus a constant proportion of gates and sprues of the identical analysis of the finished casting are used in each heat. No scrap metal is used. The turnings from the machine shop are melted, ingoted and analyzed. These ingots are used in casting bushings made to special specifications but not for "non-gran" castings.

The melting furnaces are mounted on trunnions to facilitate tilting. Not less than 1200 lb. of metal is melted at one time. Heating is by fuel oil of low sulphur content. Ladles are pre-heated and are handled on overhead track. Tabor molding machines with shockless squeezers are employed. Both cope and drag are molded at the same time.

Whenever the ratio of length to diameter is sufficiently small to permit of end draw, green sand cores are employed. This enables the use of metal patterns and eliminates baked cores. When a baked core is necessary, this is made up from clean sand with a special linseed oil compound binder intended to avoid trouble from gas in the mold.

The sand employed in molding is No. 00 Crescent mixed in the proportion of two parts old to one part new.

After the usual snagging and tumbling to clean away the sand, castings are delivered to the machine shop where the first operation is performed on a Bliss or Toledo broaching press. Two passes are required as a rule, the first pass usually being with a ball type broach and the second pass with a finish cutting broach with upper lands of the ball type for burnishing and hardening the surface. A dial feed, loaded by hand, is employed and the production rate of this machine runs about 2400 per hr.

Limits in Broaching Process

In the case of bushings cast from split wood patterns, two entirely separate broaching operations are sometimes required.

Limits maintained in the broaching processes run from ± 0.0005 to ± 0.0015 in., depending upon customer's requirements. The bushings are checked by plug gage after broaching.

In succeeding operations, location is from the finished bore of the bushing. From the broaches the bushings are passed to simple lathes with expanding air chucks and the outside diameter is rough turned. The machine is loaded and controlled by hand except for the power feed. Eccentricity is held to a maximum of 0.001 in.

If the outside diameter of the bushing is to be finish turned, it is handled in similar fashion on another lathe

A MACHINE shop superintendent who a decade or so ago thought he was following modern production methods but had since been entirely out of touch with improvements in these methods, would be dumbfounded at the rate and accuracy with which today's product is turned out.

This fact is well illustrated by the accompanying description of bushing manufacture. Instead of chucking, centering, drilling, boring and reaming, for example, an accurate and well-finished bore of a bushing is produced in a single, or at most a double, pass through a press rigged up for broaching, and this at the rate of 2400 per hour! Again the outside diameter is finished rapidly and accurately by one or two passes through a centerless grinder.

and checked with snap gages to insure compliance with customer's specifications.

The next operation is end facing which is done by two methods, either on a turret lathe with an end tool or on a simple lathe with cross slide. Here, again, the work is held in an expanding air chuck and work is to customer's tolerance, usually running from ± 0.001 to ± 0.010 in. When oil grooves are required, they are cut either on Fisher or Sacrey oil groovers. If slots are to be milled, or oil holes drilled in the bushing, this work is done on standard machines.

An alternate final operation on cast bushings with straight outside diameter is to finish grind on a Detroit centerless grinder, when finish turning is not preferred. Centerless grinding on bronze has now been developed to a point where under certain conditions it is as economical and more accurate than finish turning. In the case of flanged bushings, finish turning is, of course, required and this is done on standard high speed lathes.

Inspection of the finished product is similar to that employed on the armored bushings already described.

Possibilities of Alcohol Fuel

PROJECTS for the employment of alcohol as a component of motor fuel are being eagerly followed by the motoring public in the United Kingdom, according to a report received recently by the Department of Commerce.

The result of the recent test of the use of gas oil instead of gasoline as a motor fuel, made by the Automobile Club of France, by which it was demonstrated that it is possible to operate a motor car on gas oil at one-quarter the cost, in France of operating a similar car on gasoline, and certain successful kerosene experiments, have become secondary in interest to the projects for the employment of alcohol as a component of motor fuel.

It is stated, the dispatch continues, that "Natalite," which is a sugar-cane distillate, can be supplied at one-half the cost of gasoline, in South Africa.

Alcohol from the beet root is a state monopoly in France, and the Government is said to now have as much as 40,000,000 gal. in stock, its market price being but a fraction of that of gasoline.

With the prevailing price of gasoline, concludes the dispatch, in the United Kingdom it is not surprising that each of these several gasoline substitutes is receiving more than perfunctory consideration.

State Highway Census Makes Evident Motor Traffic Fallacies

Proves inter-state truck transport small factor in wear and tear on roads. Short hauls predominate. 14.2 per cent of tonnage carried 70 miles or over. Railroad freight service supplemented. Federal aid appropriations for benefit of industry in general.

By David Beecroft

THE oft-heard story that States situated like Connecticut, which lies between New York and Massachusetts and is traversed by the main highway lines between New York City and Boston, are compelled to build roads for the use of trucks from other States has been largely exploded by the recent census of motor traffic over Connecticut highways.

This traffic census, extending over three months, shows that 89 per cent of all the motor trucks on the Connecticut highways were Connecticut-owned trucks and that only 11 per cent of these trucks might be classed as foreign or coming from other States, such as New York, Massachusetts, Rhode Island or New Jersey.

An estimate of the tonnage carried on these trucks during the last three months of 1922 shows that 86.5 per cent of the tonnage handled on them was Connecticut tonnage, leaving only 13.5 per cent as coming from outlying States. The census figures show that 1,019,000 net tons of commodity were considered in the census.

Analysis of the tonnage carried shows that 81 per cent of all tonnage originated in the State of Connecticut, and only 19 per cent in outlying States. Here are the figures:

Connecticut tonnage	81 per cent
New York tonnage.....	7 "
Massachusetts tonnage	6 "
Rhode Island tonnage.....	3 "
Miscellaneous tonnage	3 "

This census was based on information obtained from 36,000 motor trucks using the highways of the State of Connecticut. Information covered, among other things, tonnage carried, origin of load and distance of travel for each truck. Some interesting facts were brought out with regard to the distance the loads were carried. The figures are averaged for the vehicles of the different States, and the average trips were:

Connecticut	15.7 miles
Rhode Island	33 "
New York	60 "
Massachusetts	80 "
Miscellaneous	130 "

Freight Analyzed

Still another analysis shows that only 14.2 per cent of all the tonnage was carried 70 miles or more on the motor trucks. The following figures show the percentage of tonnage and the distances carried:

36.9 per cent freight carried..	1-9 miles
30.5 " " " "	10-29 "
18.4 " " " "	30-69 "
14.2 " " " "	70 and over miles

Analysis of the freight carried shows a heavy preponderance of manufactured products, with agricultural products constituting a large percentage.

Further analysis shows that 36 per cent of the tonnage calculated in the census was carried on trucks of $\frac{1}{2}$ to $1\frac{1}{2}$ -ton capacity and 34 per cent carried on trucks of 5 to $7\frac{1}{2}$ -ton capacity.

Connecticut has always taken a keen interest in the subject of overloading and the census shows that 29.6 per cent of the trucks covered in the census were overloaded. A further analysis shows that of these trucks overloaded, 65.2 per cent or almost two-thirds of them were overloaded to the extent of a ton or less.

Reasons for Forwarding Obtained

Those in charge of the census went further than mere figures and obtained the reasons for the forwarding of freight by motor trucks. These figures are interesting because of the fact that 70 per cent of all the tonnage carried on the trucks covered in the census was pickup to deliver freight, that is, the truck picked it up at its origin and transported it to its final destination. No other medium of transportation entered into the work.

Some of the many reasons for the use of motor trucks in preference to other modes of transportation follow:

1. Congestion in railroad terminals.
2. Motor trucks are faster.
3. Smaller stocks of goods carried on hand by virtue of the service given by the motor truck.
4. Fresher goods in stock by virtue of motor truck service.
5. Railroad embargoes made use of motor trucks imperative.
6. Motor truck gives better service.
7. Deficiency in railroad service.

After presenting these figures of the Connecticut census obtained by the Highway Department of the State of Connecticut, Thomas H. MacDonald, director of the Bureau of Public Roads, Washington, D. C., drew certain very remarkable conclusions, as far as the transportation of freight over the highways is concerned. Director MacDonald was very specific in his remarks, which were made at the dinner of the American Road Builders' Association in New York. His words were:

"We are not going to take freight traffic off the highways. We are not building highways as fast in New England as the growth of business demands.

"In the reasons given by the shippers for using motor trucks the question of rates was not mentioned; in other words, rates charged were not a factor, but rather service was the major consideration.

"These figures indicate that the highways are bringing a great measure of relief to the railroads of Connecticut, rather than competing with them.

"We have hardly started to build highways in this country as yet, and what building has been done is in response to a demand from the public for that character of service which highways will give."

Director MacDonald referred to the statement made by Elisha Lee, Vice-President of the Pennsylvania Railroad, at the annual dinner of the Society of Automotive Engineers held in New York City in January, 1923, in which Lee stated that there seemed to be an era of building long-distance hard-surfaced highways for the use of motor cars. Director MacDonald answered this by showing that 73.2 per cent of the highways built under Federal and State aid are for rural highways and should be described as development roads; and that only 26.8 per cent of the roads built since 1916 under Federal aid are hard-surfaced types. In other words, only 26.8 per cent of the roads built under the Federal aid program could be intended for motor truck traffic.

Not a Competitive Field

The natural inference from Director MacDonald's words was that a motor truck as indicated from the Connecticut census is not in a field of competition with the railroads but rather in one of cooperation, as the character of service indicated by the census figures shows.

A very erroneous conception is had, in many quarters, of the mileage being improved under the Federal aid system. The system embraces only 7 per cent of the 2,800,000 miles of public roads in the United States. To put it another way, there are only 194,000 miles in the complete system of Federal aid as laid out at the present time.

The proportion of Federal aid mileage to the entire road mileage of the country is about the same as in France. To be exact, 6.3 per cent of the French roads are in what is designated as its national highway system.

In New York State 13 per cent of the mileage is in the State system of roads.

The same figure applies to the State of Connecticut.

In view of these figures it can scarcely be said that the Federal aid money is going to build long-distance motor routes. Here are some figures that indicate that the Federal system of highways in the different States is laid out to connect up the important towns of the country:

In the State of Maryland 98 per cent of the population live within 10 miles of the State highway system, that is, within a belt extending 10 miles on either side of State roads.

In Indiana 99 per cent of the population live within 10 miles of the State highway system roads.

In Arizona, where population is sparse, 67.5 per cent of the population live within 10 miles of the State roads.

In all of the thirty-three States where the Federal highway system has been agreed upon, all towns of 5000 population and over are located on this highway system.

Highway System Serving Nation

These figures demonstrate conclusively that Federal aid appropriations are being made for the benefit of industry and population and not, as suggested by Lee, along long-distance motor routes.

Director MacDonald has the utmost confidence in the service of a highway system to the transportation needs of the nation. He recognizes four major methods of transportation:

1. Railways.
2. Waterways.
3. Highways.
4. Airways.

He recognizes that the transportation of the country is organized on a basis of using the railroads for major move-

ments, and that to carry out successfully this function the railroads must continue developing and obtain new capital, but that with this thought in mind highways will take over a very definite part of the transportation of the nation.

During 1921 there were expended for rural highways of all character approximately \$970,000,000, of which amount approximately \$500,000,000 was handled by localities and \$470,000,000 by Federal aid and State highway departments.

Since Federal aid was instituted in 1916 \$452,000,000 have been appropriated, of which \$230,000,000 has actually been paid out and the balance available as soon as it can be used.

Under the Federal aid system 14,000 miles of highway are at present under construction.

Up to the present approximately 25,000 miles of highway have been completed under the Federal aid system. This has been done since 1916.

Further census figures show that the passenger car used for business carried an average of 1.7 passengers and the average length of trip was 29.7 miles. Passenger cars used for non-business purposes averaged 3 persons per vehicle and the trips averaged 55.5 miles.

Figures from the Connecticut census presented by Director MacDonald show that passenger automobiles play a big part in the business traffic of the State of Connecticut. The census covered 45,000 passenger cars, and the figures show that 37 per cent of these were used for business purposes and the remainder for non-business purposes.

Automotive Labor Analyzed

ANALYSIS of wages and labor in the automobile industry in 1922, as compiled by the Bureau of Labor Statistics, Department of Labor, shows that the average earning per hour of males in all is 66.2 cents and of females 43.8 cents.

Basing their calculation on data covering 54,930 male employees in 49 establishments and 1379 females in 28 establishments, the bureau found that the average full-time hours per week for both males and females are approximately 50; and that the average full-time earnings per week of males in all occupations are \$33.19 and of females in all occupations \$22.05.

Studying the several occupations it is seen that the average earnings per hour of males (apprentices excepted) range from \$0.455 for laborers to \$0.931 for varnishers, strippers and letterers; and of females from \$0.352 for inspectors to \$0.680 for "other skilled employees."

In discussing the labor and wage situation in the automotive industry the Bureau of Labor Statistics says:

"The great majority of wage earners in the industry are pieceworkers, with their average earnings per hour dependent, therefore, upon the number of pieces or jobs completed in a given period of time. Since 1899 the industry has passed through a period of many experiments and radical changes. Improved organization and the development and installation of improved machinery have greatly increased the output of the establishments and the average output per man per hour."

EXPERIMENTS have been made recently in England with an inverted form of Napier "Lion" 450 hp. aircraft engine. It is stated that after surmounting great difficulties, especially in connection with lubrication, the engine was successfully tested and developed as much power as the upright engine. By inverting the engine the view of the pilot is improved, and the exhaust gases can be disposed of in a better way.

Four-Wheel Brakes Fill Real Need for Better Car Control

All makes should be equipped with them, Malcolm Loughead tells Detroit Section of S. A. E. Answers more than sixty pertinent questions. Thinks external applications more efficient than internal types. Gives details concerning hydraulic models.

EXTERNAL four-wheel brake applications will be favored more strongly than internal types because of their lower cost of production, ease of service, lighter pedal pressure and freedom from drum distortion, according to Malcolm Loughead, chief engineer of the Four Wheel Hydraulic Brake Corp., who presented a paper on the design and operation of four-wheel hydraulic brakes before the Detroit Section of the Society of Automotive Engineers on May 17. Loughead claims superior equalization and higher mechanical efficiency for the hydraulic system as compared with the mechanical. He favors a ratio of 1 sq. in. of brake lining surface for each 12.5 lb. of car weight in order to secure the maximum returns from the brake lining.

The meeting was attended by 300 Detroit engineers. Following the system inaugurated this winter, members were provided with cards upon which to write questions to be answered by the speaker. Questions on the sixty cards turned in indicated an extremely lively interest in the subject. In addition there was a short general discussion. Loughead said in part:

Is there a genuine need and demand for better motor car control? Does the four-wheel brake meet this need in a practical manner? I believe the first question can be answered by referring to the statistics showing the appalling and constant increase in accidents, resulting in loss of life and property damage, and the feeble and ineffective attempts to better the condition by the enactment of drastic and, in many cases, unfair and unpopular legislation to govern the speed at which motor cars may be legally driven.

In answer to the second question, I feel qualified to say that the four-wheel brake of proper design does actually meet the condition in a practical and satisfactory manner, for I have had during 6 years opportunity to observe the performance of practically 1000 cars so equipped and in the hands of the typical owner-driver.

It is my belief that their general adoption will soon result in a more uniform regulation of traffic and speed, permitting with safety a greater rate of speed, thus increasing the utility of the motor vehicle.

80 Per Cent of Vehicles Need Brake Service

For the purpose of comparison only, let us say that the four-wheel brake of proper design represents 100 per cent efficiency. The rear-wheel brake of conventional and accepted design represents 43 per cent efficiency, and brakes applied to the front wheels only represent 75 per cent efficiency. These are not figures taken at random, but are prepared from a carefully worked out formula which is sustained by actual tests.

It is more common, however, to find cars in service with the rear-wheel brakes delivering far less than this efficiency. Fully 80 per cent of the motor vehicles in service will be found badly in need of brake service of a character that the average owner-driver is incapable of providing and which in many cases cannot be provided by the average mechanic. It is quite common to find such cars unable to stop in less than 130 ft. when driving at the rate of 30 m. p. h.

Four-Wheel Brake for All Regions

Some have contended that the four-wheel brake would find favor in the hilly or mountainous region of the country, but that there is no particular need for them in a flat country. This theory does not seem to prevail in railroading. Trains on the middle western and desert divisions are equipped with brakes identical with those used in the mountain divisions. The need to meet an emergency exists in either case.

Before going into a description of hydraulic brakes I wish to draw a comparison between external and internal brakes. There is some difference of opinion among engineers as to the most desirable application, but it is my opinion, based upon considerable experience with both types, that the external is the type offering most points of advantage. The four outstanding points against the internal application are:

1. Cost of production.
2. The greater difficulty involved in service and adjustment.
3. The exceedingly heavy pedal pressure required where no service mechanism is used.
4. The expansion of hot drums, and the distortion of drums where internal pressure is applied.

To compensate for this expansion and distortion of the drum, the design must incorporate a low ratio of pedal movement to shoe movement. Otherwise, on a long-sustained brake application, or several severe sustained brake applications, there may not be sufficient throw of the pedal to compensate for the expansion and distortion of the drum. This necessitates a low ratio of pedal movement requiring excessive effort to make the application. An expensive drum construction will, to some extent, relieve this situation, but even in foreign practice, where expense has been secondary, it has been necessary to use the servo device to produce a brake easy in application. For the internal application it can be said that a cleaner design may be developed, and better protection from dirt and mud, etc., be provided.

The external application meets the requirements of large production, for it is cheap and simple in design.

It offers the minimum in service difficulties. Its adjustment is of a character that does not require expert attention, but may be handled by any person. The pedal pressure required to make a stop is very light, because advantage can be taken of the wrapping action of the band in the forward rotation of the wheel (about 200 deg. on the wrapping side). It is also possible to take advantage of the high ratio of pedal movement to band movement, as such expansion and distortion of drum as may result from a long and continued application is moving that element in closer relation to the predetermined adjustment of the band. These favorable conditions eliminate any need for a servo device. Its exposure to the elements is not to be seriously considered, as the industry's experience of many years with the external brake as applied to rear wheels only has not shown that any serious results are occasioned by the exposure.

Little Danger from Locking

The fact that the external type of brake, as applied to rear wheels, has been adopted almost universally by American car manufacturers proves conclusively that this type is the most satisfactory. This being the case, I cannot see how the application of brakes on four wheels of a vehicle could possibly involve the question of which type of application is most satisfactory.

Two points commonly brought up in discussing four-wheel brakes are the locking of front wheels, and rear end collisions. If front wheel brakes are improperly designed, the locking of wheels may cause a serious accident. My experience has been that it is advisable that the front and rear brakes be of the same size and design. It will mean a sacrifice of stopping ability under dry-road conditions if the rears are larger than the front. If the front are larger or more efficient than the rears, it will mean locking of the front wheels, especially when the road has a low coefficient of friction. We have had no accidents reported to us due to the locking of front wheels. This does not only reflect my personal experience, but is the experience of some 1000 owner-drivers, and covers approximately 7,000,000 miles of uninterrupted service. To the best of my knowledge there has never been an accident due to the locking of front wheels.

The matter of rear end collisions is another point that gives a great deal more trouble in theory than on the street. There have been a few instances where this has occurred, with very small damage to the car with four-wheel brakes. One point to be remembered is that the person following has a reasonable chance of stopping, since he is, as a rule, from 15 to 30 ft. back of you and has that much additional space in which to make his stop.

Equalization a Great Advantage

The hydraulic principle as a means of applying brakes to an automobile has one decided advantage over those operated by mechanical means, and that is equalization. By utilizing the hydraulic means of application it is possible to apply exactly the same pressure to each of the four bands and, due to the inherent equalization of a column of liquid acting under pressure against pistons in cylinders, it will remain equalized indefinitely regardless of the band adjustment.

There seems to be no part of an automobile more neglected than the braking system, both as to adjustment and lubrication. In the system which we are now using the possibility of bearings seizing is reduced to a minimum. The only possibility of this occurring is at the pedal bearing, or yoke end. These bearings are quite accessible and fairly well protected under floor boards.

Another strong point in favor of the hydraulic system is that the brake adjustment is not affected by a change of load, so the movement of the body in relation to the axle over a rough road does not react against the foot pedal. This condition does exist more or less on all cars equipped with mechanical brakes, and is very noticeable going down a rough grade, the brakes having a tendency to alternately lock and release, due to spring movement. This feature of the hydraulic system makes a very strong demonstrating point when compared to the mechanical system, as the hydraulic action is very smooth on the roughest of roads.

Tests have shown that with the car fully loaded it is necessary to provide approximately 1 sq. in. of brake lining surface for each 12.5 lb. of car weight. If this ratio of car weight to area of brake lining is increased to over 16 lb. it is possible to burn the surface of the lining, thereby causing a decided drop in the coefficient of friction of the lining material. The figures taken, 12½ lb. of car weight, conform more or less to standard practice in rear-wheel brakes, when you consider the case of a car with seven passengers, weighing 5360 lb., of which 3200 lb. is carried by the rear wheels. The average area of brake lining for a car of this weight is approximately 225 sq. in., which carries 14.5 lb. of car weight on the rear wheels for each square inch of brake lining.

Owing to the shift of the center of gravity where brakes are applied on all four wheels, the car weight per square inch will be somewhat greater on the front wheels.

Method for Testing Stopping Distances

The following figures were taken as an average of five stops in each case, all tests being based upon car speed of 35 m. p. h.

Rear wheels only, 89 2/10 ft.

Front wheels only, 67 6/10 ft.

Front and rear wheels, 36.8 ft.

I have here some data on tests made recently with the system I am about to describe.

All stops taken at 30 m. p. h.

Make of car—Model 57 Cadillac Phaeton.

Weight of car, 4400 lb.

Weight on rear wheels, 2400 lb.

Weight on front wheels, 2000 lb.

Make of tire, Mason cord.

Size of tire, 35 x 5.

Tire pressure, 65 lb.

Road surface, concrete. Dry.

Method used to determine stopping distance:

At this juncture I wish to state that many tests have been reported based upon more or less estimates of stopping distance, the method commonly used being to drive the car at a certain speed and at a given mark on the road apply the brakes; measuring the distance from the said mark to the point where the car came to a stop. An effort to produce a more accurate result suggested to me some of Goldberg's funny mechanical contraptions. I have mounted a pistol to the frame, with its muzzle 12 in. from the ground and hooked up with the brake pedal so that it is discharged when the brake pedal has moved 1 in. Taking the bullet mark in the road as the point at which the brake application was started and computing the distance from that point to the point where the car actually is brought to a dead stop.

This method, if you will try it, will prove to you conclusively that no accurate stopping distance can be ascertained with the method of applying brakes as car

passes a given mark. In fact, you will find that a most conscientious attempt to be honest with yourself will result in giving you all the best of the test, resulting in claims of anywhere from 6 to 10 ft. better performance than is actually accomplished.

The system we are now using consists of four brake-band operating cylinders mounted rigidly to the dust shields or anchor brackets at each of the four wheels. Within each of these cylinders are two pistons acting against two levers, which are connected in turn to the brake-band ends. Liquid is admitted to these cylinders through an opening at their center and between the two pistons. Drawing these band ends in a tangent line to the brake drum and not allowing the ends to "snub" insure a smooth action.

Practically No Expansion Loss

The four hoses mounted between the frame and each of the wheel cylinders consist of seven-ply rubber hose, having a bursting pressure of 2000 to 2500 lb. per square inch. These hoses have a close wound coil spring inserted while the hose is under a pressure of 1200 to 1400 lb. per square inch. This means there is practically no expansion loss up to 1000 lb., and is a very important point in hydraulic brakes when you stop to consider that there are two movements that must be taken care of by flexible means; that is, steering and spring movement.

Any expansion loss in the system means a loss of pedal travel, and to make up for this loss it is necessary to reduce the pedal leverage, which means high pedal pressure.

The copper tube used in the chassis is supported with clips inside the channel of the frame. The master cylinder, or the cylinder that is connected to the foot pedal, is mounted on the transmission case at right angles to the pedal lever, the piston in this cylinder being connected by means of a yoke or eye bolt to the pedal lever.

When this piston is in the off position it uncovers several small port holes (about 0.020 in diameter). This allows a free flow or liquid from the tank to the cylinder and replenishes any loss that may occur during application of the brakes. This loss is very small. We have run cars for as much as 3 or 4 months with a closed line, losing practically none of the fluid.

Questions asked by members covered a wide variety of points suggested by the paper. Some of the queries and answers follow:

1.—What liquid is used in the hydraulic system?

Ans. Glycerine 60 per cent, alcohol 40 per cent.

2.—What is the cost of the hydraulic system as compared with the mechanical?

Ans. The cost is about equal.

3.—Must the front axle be redesigned to take the front wheel brakes?

Ans. It must be so designed that the center line of the king pin will fall within $\frac{1}{2}$ in. of the point of tire contact with the road.

4.—What possibility exists of the liquid congealing?

Ans. Increasing the alcohol in very cold weather will offset this.

5.—What is done to meet the situation where two sets of brakes are required by law?

Ans. Mechanical emergency brakes the same as are used now either on the rear wheels or on the propeller shaft are employed.

6.—Are the rear-wheel brakes designed to come into effect before the front, in view of the greater efficiency of the front brakes?

Ans. No, the shifting of the center of gravity toward

the front axle in stopping equalizes the greater weight on the rear. A test of one car at 30 m. p. h. showed a stop of 67 ft. with the front-wheel brakes alone, and 89 ft. with the rear-wheel brakes alone.

7.—What would happen if a pipe should leak or break?

Ans. The same as if a brake-rod should break. The brake would be out of commission and the pedal would drop to the floor.

8.—Are torsional stresses greater on the front axle?

Ans. Yes, the front axle must be designed for them.

9.—What is the effect of wheel camber on the action of the brake?

Ans. None.

10.—What has been the increase of the weight of the Cadillac cars on which the four-wheel hydraulic brake system has been installed?

Ans. The weight increase has been about 70 lb. total per car.

11.—Are front axles as now designed stiff enough for front-wheel brakes?

Ans. No, a better torque section is required.

12.—Can an internal brake wrap internally?

Ans. Yes, but not as effectively as an external brake.

13.—What per cent stronger would the front axle have to be?

Ans. No stronger from a bending standpoint, but it would have to be stronger torsionally.

14.—What happens with air in the line?

Ans. Air in the line would mean loss of effective brake pedal travel.

15.—What is the effect of temperature on the fluid in the system?

Ans. It makes it sluggish below zero, but this can be compensated for by additional alcohol.

16.—Is tire mileage increased by the use of four-wheel brakes?

Ans. Yes, because it is never necessary to slide the wheels.

17.—What change in the front springs would be required?

Ans. None.

18.—How many adjusting points are there on the system?

Ans. There are three per wheel, one on each end of the band and one at the anchor point.

19.—What is the percentage of loss of the liquid in the system?

Ans. It varies. There are cases where there have been 20,000 miles of use with practically no loss.

20.—Is there any churning of the liquid in the system?

Ans. There is churning, but it has no noticeable effect.

21.—Does the liquid in the system rot the rubber tubing?

Ans. No, because it has preservative qualities.

22.—What is the minimum weight of car for which four-wheel brakes are suitable?

Ans. The weight of the car does not make any difference as regards its ability to stop. Consequently, all cars should be equipped with four-wheel brakes.

23.—What is the comparative efficiency of four-wheel brakes and two-wheel brakes on wet pavements?

Ans. It is impossible to give the efficiency under conditions of this kind, as it would vary too much. The most important effect of the four-wheel brakes in a case of this kind would be to eliminate skid.

23.—Is not the equalizing effect of the hydraulic system offset by the variations in the coefficient of friction of the brake lining?

Ans. The variations in the coefficient of friction of the linings on one car for different wheels would not be very great.

24.—What is the maximum change which has been noticed in the coefficient of friction of the lining?

Ans. We have noted it to vary between 0.2 and 0.46.

25.—Do the brakes run as cool with an external as with an internal system?

Ans. Yes, with the pressed steel drum.

26.—Does the effect of water show up more with the internal brake than it does with the external?

Ans. The water gets out of the external brakes better.

27.—What is the effect of a flat tire, particularly of the balloon type, with the four-wheel brakes?

Ans. A quicker stop with less skidding could be made with the four-wheel brakes.

28.—How do you prevent leakage past the pistons in this system?

Ans. Rawhide cups are used as a seal. Rawhide has been found to be of advantage, because with tanned leather in the tanning process the fat cells are cured, causing porosity, while the rawhide is not porous.

29.—What about the car behind in a case of a quick stop?

Ans. It is up to the driver behind, who should not be following too closely.

30.—Should the front-wheel brakes come into action before the rear wheels?

Ans. The center of gravity shift is relied upon to take care of this.

31.—What is the clearance used between the lining and the drum?

Ans. A minimum of 0.025 in.

32.—Does the brake lining wear less with four-wheel brakes than with two-wheel brakes?

Ans. Yes, in one case of a car driven in the Rocky Mountains the brakes went over 30,000 miles without relining on a four-wheel brake set, whereas on a two-wheel brake set they had to be changed every 2500 miles.

33.—How do you keep the car from going into a front-wheel skid?

Ans. It is up to the driver, who must learn to release his brakes and reapply them if the car shows a tendency to go into a front-wheel skid, due to locking the front wheels.

34.—Is there an individual adjustment on the brake on each wheel?

Ans. Yes, for wear.

35.—If the front-wheel brakes lock, do you lose steering control?

Ans. Yes.

36.—How does the reservoir function to supply liquid to make up for that loss?

Ans. It is a gravity feed from an auxiliary tank to the master cylinder.

37.—Is the brake band continuous or is there a gap?

Ans. A gap is left.

38.—How often is it necessary to repack the pistons in the master cylinder?

Ans. We have never had to repack one as yet.

39.—Have you tried riveting the brake band to the drum on an internal brake with an expanding shoe to overcome drum expansion?

Ans. We have not tried that.

40.—If the wheels are locked will the car slide straight or will it tend to turn?

Ans. It will slide straight except on the crown of a road, when it will tend to turn slightly.

In addition to the above questions there were several letters from engineers who were not able to be present, expressing interest in the subject. W. Saholm, of Cadillac, sent in a written communication in which he cited some of the early attempts to use four-wheel brakes, particularly

referring to cars back as far as 1909. He stated that there were several at the 1912 Olympic show. Seaholm pointed out that there are two schools, one which desires to secure the maximum braking effect and the other effective but easy deceleration. He states that he favors the latter. He states that four-wheel brakes are coming, but they must be good installations.

E. R. Evans, of the Rickenbacker Motor Car Co., stated that the public must be educated to handling four-wheel brake cars. He stated that this campaign of education may result in losing sales for companies bringing out cars with four-wheel brakes at first, but it will eventually prove to be the wise policy in the long run.

T. J. Little, of the Lincoln company, cited a number of experiments he had recently made in which he had put grease on one of the brakes to see if there would be a tendency for the car to veer to one side because of unequal friction. He stated that he had been agreeably surprised by the small effect that the grease application on one wheel had on the action of the front-wheel brakes.

Diesel Engine Practice Described

SINCE the original Diesel patents ran out and the manufacture of the Diesel engine was taken up by a considerable number of manufacturers, quite a bit of literature has grown up around this type of engine.

The great majority of the engines that have been built are of large size and require an engineer to run them, and most of the books on the subject that have been published are intended chiefly for the user or operator of the engine. This applies to "The Diesel Engine" by A. Orton, one of the Technical Primers published by Sir Isaac Pitman Sons, Ltd.

The endeavor of the author, according to the preface, has been to treat the subject in the simplest possible manner, so that it can be followed readily by students, mechanics and others not yet well versed in internal combustion engine matters. At the same time nothing is omitted of vital importance affecting the main principles of working and the standard methods of construction.

As an elementary textbook on the subject and a guide to efficient operation of Diesel engines the book should serve a useful purpose. A comprehensive bibliography is given for the benefit of those readers who may wish to pursue the subject further.

ATTENTION is called to a recently published automobile laboratory manual. This manual is written by Frederick Good to furnish a progressive series of study units which will serve as a basis for the organization of laboratory automobile classes for beginners.

This admirable little book is intended to be used in conjunction with regular textbooks, and gives an opportunity for the student to gather a working rather than a talking knowledge of automobile design.

The manual is published by the McGraw-Hill Book Co., Inc.

Correction

IN the article entitled "Material Selection Should be Based on Strength-Weight Factors" by Horace C. Knerr which appeared in AUTOMOTIVE INDUSTRIES of April 19, a footnote under Table 6 states that certain data were taken from the catalog of the Western Electric. This should have read Westinghouse Electric & Manufacturing Co.

Factory Cooperation with Dealers Makes Better Service Possible

Manufacturers' representatives show keen interest in dealer maintenance problems at Detroit convention. Piece-work method of paying mechanics has phenomenal growth. Flat rate system universally endorsed. Special schools foster better repairs.

By Donald D. Blanchard

BETTER service through closer cooperation between factory and dealer was the keynote of the convention of factory service managers, held on May 15 and 16 in Detroit. The factory men evidenced a very keen interest in the problems of dealer service station operation and showed a clearer appreciation of the nature of these problems than ever before. Dealer profits also were mentioned occasionally during the discussion.

Heretofore service has been considered largely as something the dealer must provide to sell cars. At the recent convention, however, it was suggested that the dealer be impressed with the importance of service not only because of its relation to car sales, but also because of the possibilities for profit in the sale of repairs and parts.

The delegates showed themselves keenly interested in getting information that would help their dealers give better service. There was much discussion of service salesmanship, flat rates, piece-work compensation of mechanics, and the education of shop workers in proper repair methods. The possibility of educating the car owner to take better care of his automobile was also discussed, and ways and means of getting this information to owners were pointed out.

That the piece-work method of paying service station mechanics is certain to come into very general use was evidenced by the favorable testimony of several men present who had had personal experience with this system of compensation. They look upon it as an essential feature of the flat rate system and believe that it is an improvement over the hourly basis from every standpoint.

General Approval of Flat Rate System

Approval of the flat rate system was general with the exception of some traditional opposition which was largely based on technicalities. Some of those present did not believe it right to call it a flat rate unless the customer is quoted a definite price for the whole job when he signs the order. This is not usually done, as it is difficult to quote a definite price for material before disassembly. This objection is being met in some cases by giving a flat rate on labor and a maximum estimate on parts. Those who object to the use of the term "flat rate" on this basis were unnecessarily technical, however. The primary object of the flat rate is to provide a basis of charging the customer that will be satisfactory to him. Experience shows that, under the time and material system, practically all the kicks registered by customers were on the labor charge, exception seldom being taken to the item for material. For this reason a flat rate on labor fulfills the essential requirement of

satisfying the customer. The occasional owner who kicks on the material charge can be satisfied very easily by giving him a maximum estimate.

During the discussion of the flat rate system, A. B. Cumner of Autocar stated that in his company's Philadelphia service station the maximum estimate system is used for both labor and material. He said that during a two month period the total of estimates was \$36,000, and that the total of invoices was \$35,600. In other words, if the customers of this station had been given flat rate prices instead of a maximum estimate, their bills would have been increased by about 1 per cent. These figures are striking proof of the fact that the cost of service work can be estimated in advance with a great degree of accuracy.

Piece Work System of Paying Grows

Most of the factories represented either had developed a schedule of flat rate operations or were working on it. One service manager said that 65 per cent of his distributors were using the system and that they were endeavoring to get their dealers to put it in.

The growth in the use of the piece work system of paying service station mechanics has been phenomenal. One delegate said that in his company's Detroit branch the piece-work method had been found to be a decided improvement over the hourly basis. The mechanics in this station are receiving 40 per cent of the flat rate charged the customer and, on the average, they are earning 20 per cent more than when they were working on the hourly basis. D. E. Purdy of Hupmobile mentioned as another advantage the fact that it provided an incentive for mechanics to design special tools which enable them to work faster.

A representative of the Hudson company gave some interesting figures on results obtained in this manufacturer's Detroit branch. He said that, when this branch was operating on the time and material basis, 3032 jobs were handled during one 14-week period with a force of 35 men. On the flat rate and piece work method a count was made over a 13-week period, during which time 3800 jobs went through the station with a payroll of 29 men. These figures show conclusively how men will increase their productivity when the incentive is provided.

Discussion of educational methods was opened by T. W. Holloway of the Cadillac company, who described the technical service school conducted by his company. This school is open to the employees of Cadillac distributors and dealers. No tuition is charged and the only expense is for board, lodging and transportation, which is frequently borne by the dealer or distributor. Most of the Cadillac educational work among dealers is done

by road technical men, but this school is now rendering additional service along this line. The course in this school lasts two weeks.

The school equipment consists of a complete car, individual units, and a complete equipment of special tools for handling Cadillac work. The Repair Manual is used as a text book and sections are assigned for home study. Daily quizzes are held and there is a written examination at the end of the course.

Educational Endeavors

R. H. Armstrong of Oakland told of the work his company is doing along educational lines through the medium of two-day service meetings at distributing points. All phases of service are discussed at these meetings and mechanics attending are urged to tell about their methods of doing things. Often special tools and shortcuts of great practical value are discovered in this way. Technical men from the factory and representatives of the equipment makers speak at these meetings.

Ways and means of educating car owners to take better care of their cars were also discussed. There is no doubt that operating costs can be considerably reduced by proper care and the factories are interested in spreading owner maintenance information. Cumner of Auto-car moved that a standardized owner maintenance creed be prepared and adopted. This creed will feature the importance of frequent inspections and regular lubrication. He said that 75 per cent of all repair work, excepting that caused by accidents, was avoidable. This creed, when adopted, will be recommended to the factories for use in their national advertising.

Clyde Jennings, *Motor Age*, pointed out that dealers should be educated into believing that there are profits in the sale of maintenance and parts. He stated that this phase of service had not been emphasized to the extent it deserves and that dealers would not realize the possibilities of this department until they had been shown how they could make it pay a profit. R. A. Shelly of Dort also emphasized this point. There is no doubt of its importance, as there are many dealers who look upon their shops as a liability they would like to get rid of, and as long as they have this viewpoint it is not likely that they will give a high quality of service.

Jennings also made a plea for more human treatment of dealers by factories. He said that the use of form letters to answer dealers' correspondence was causing much dissatisfaction. He said that, in many cases, factories do not have the influence they should because dealers do not believe that their problems are understood by the factory.

The consensus of opinion at the convention seemed to be that any advertising of service facilities at this time would be premature, as there are so many dealers who would not be able to make good on the copy used. L. C. Voyles, Marmon, whose company has done considerable advertising of this type, said that it would provide an incentive for dealers to put their houses in order so that they could live up to the advertising. He pointed out that if the matter was put off until all service stations were what they should be, the campaign would not start until the day before the millenium.

The dealer was pictured as the foundation of all sales promotion work by J. H. Newmark, who said that if he did not give good service all promotional effort would fall flat. He stated that it was up to the engineer to design a car that is easy to service. He also brought out the fact that much of the misunderstanding which the service department encounters is the result of promises made by the salesmen. Bonham stated that it was the aim of Durant Motors to put parts and service sta-

tions at least every 25 miles on all the important highways of the country. These would make it easy for Durant owners to get service and genuine parts. He also said that Durant has thirty-one men on the road whose duty it is to visit all service stations three times a year to see that they are being conducted properly and that they have necessary tool equipment and adequate parts stocks.

The convention was addressed by Richard Harfst, manager of the local Cadillac branch; T. W. Holloway, assistant technical manager of the Cadillac Motor Car Co.; L. V. Pulsifer of Valentine & Co.; J. H. Newmark, manager of sales promotion of Durant Motors, and by B. G. Koether of the advisory staff of the General Motors Corp. Koether's speech opened the convention and consisted of a word picture of the assets and liabilities of the industry. He listed as the industry's greatest asset the universal desire to own a car and as its greatest liability the high accident rate.

Fred Smith, manager of the Automotive Service Association of Brooklyn, explained the efforts they are making to single out the reliable service stations. He said they were selling proprietary memberships in the association for \$10 each to authorized and independent service stations that could show that they were doing an honest business. This gives them the privilege of displaying the sign of membership. The money obtained in this way will be used to advertise the importance of trading with shops displaying these signs. Any member convicted of unfair dealing will lose his membership and the right to display the sign.

Diesel Engine for Automotive Use

THE San Francisco plant of the Bethlehem Shipbuilding Corp. has announced the completion and successful operation of a 30-hp. Diesel type engine said to be suitable for automobile and truck service. It is claimed that the engine has already seen some 18 months' service of this character and that it can be built in sizes as small as 3 or 4 hp.

J. J. Tynan, vice-president and general manager of the corporation, states that the automotive engine now in use is a three-cylinder two-stroke unit and is operated on oil of about the same gravity as that used in submarine service, costing about 3c. per gal. The engine is a reversing type and requires no electric ignition. It is claimed the engine weighs about half as much as the average automobile engine of same power output, that it has a life equal to that of a steam engine and a fuel consumption of $\frac{1}{2}$ lb. per hp. hr.

The usual claims in respect to flexibility, less vibration, smaller number of wearing parts and need for fewer replacements are made. Fuel is introduced by an injector. Exhaust temperatures are reported to run from 170 to 240 deg. F.

The transmission is described as being a "cone-shaped device on which the interlocking member slides to and fro instead of shifting." Gear shifting is said to be eliminated. A clutch which permits the engine to idle is employed.

The engine design is understood to have been conceived by Edward Lowe, a former Navy employee whom Tynan aided in development work. Associated with Tynan is P. L. Jocelyn, chief engineer of the Bethlehem plant.

Tynan has announced that the engine is to be manufactured in quantity in San Francisco and states that one 3000 hp., one 300 hp. and one 30 hp. engine are now being built. The engine is not yet being shown publicly.

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Less Hand Finishing on Bodies

ONE large factor in the cost of body manufacture is the great proportion of hand work required, not only in painting and trimming but in smoothing out irregularities which occur in metal parts even when these are die-formed.

So long as this condition prevails it will be impossible to produce bodies as economically, relatively speaking, as chassis parts. Consequently it behooves those who produce bodies, body materials and tools to make a careful study of the factors which now make hand work imperative with a view to reducing the need for them to a minimum.

This means research, careful investigation and analysis, involving shop as well as laboratory tests, not of an abstruse, but of a highly practical character.

Some lots of sheet metal have better drawing characteristics than others. Different batches purchased, and presumably made, to the same specifications often give quite different results in the same dies. The

reasons for these differences must be sought out and the manufacturing processes corrected to give uniform results. Otherwise much hand work appears inevitable in removing surface irregularities.

It is evident, however, that highly polished finishes, such as are now almost universally employed, accentuate surface irregularities and make them far more apparent to the eyes than they would otherwise be. Furthermore, polished surfaces are easily marred in service and have never seemed well suited for use where dust and mud are inevitably encountered.

This raises the question as to whether it is not possible to develop a kind of finish which is non-lustrous and more durable, as well as more suitable, for finishing passenger car bodies, at the same time reducing the need for taking out the smaller surface irregularities which now require so much hand work. In any case, experiments along this line are worth trying and may help in the solution of a problem which must be solved sooner or later because of the demand for bodies which are cheaper and at the same time more satisfactory from a service standpoint.

What Constitutes "Normal"?

EVER since the slump of 1920 there has been an endless discussion of what constitutes "normal." All kinds of opinions have been hazarded, especially in relation to the automotive industry, but all the guesses appear to have been wrong. As a matter of fact, nobody knows.

Comparisons with pre-war volume fall far short of the mark. As Secretary Hoover pointed out in an address the other day, "normalcy is a vastly higher and more comfortable standard than 1913." The consumptive as well as the productive capacity of the country has moved ahead at a much faster rate than the population increment which has approximated 14,000,000 in the past decade.

Indications now are that 1919 and the early part of 1920 were much more nearly the present day normal than any of the years which preceded them. Big as business was in those years it has fallen below the level established in the first third of 1923. This is demonstrated conclusively by freight car loadings and steel production which constitute accurate barometers. This activity undoubtedly has been somewhat abnormal and if production were continued at the same rate it soon would exceed demand.

In attempting to determine what constitutes normal, more uncertainty exists in relation to motor vehicles than almost any other manufactured product. Time may prove that the total of 2,577,000 produced in 1922 will approximate normal for some time to come. If it does, the industry will have no ground for complaint so far as volume is concerned. Profits were satisfactory in some branches of the industry and in some they were not.

One thing is certain and that is that the pace maintained in the first four months of this year cannot be maintained indefinitely. Practical stabilization will arrive sooner or later but predictions as to when that time will come are hazardous.

Time of Real Temptation Has Arrived

AFTER months of intense industrial activity, with rapidly rising prices and expanding credit, there has appeared a distinct reaction in speculative markets. Wholesale buying has slowed down and there has been some recession in wholesale prices. Building projects involving many millions of dollars have been abandoned temporarily because of peak material prices and the exorbitant demands of labor.

Notwithstanding hesitant prices and reduced volume in wholesale buying, production continues at high speed except in two or three lines. This constitutes the chief menace to industry at the moment. Up to this time there have been no large accumulations of finished products. Production has little more than kept pace with demand and in some lines it has lagged behind.

The big question is whether the reactionary tendency of the past two or three weeks has merely marked a lull in operations, due in part to unseasonable weather, or whether it definitely marks the beginning of the end of boom conditions. The next few weeks will supply the answer and automotive manufacturers should watch the situation carefully.

As far back as March 1, AUTOMOTIVE INDUSTRIES said in an editorial:

"There is nothing in the air to occasion pessimism, but there are many indications that caution is advisable and will become increasingly so as mid-year approaches. The automotive industry will be wise if it applies the lessons learned in 1920 and is prepared for any possible eventualities notwithstanding the fact that it is assured of having a good year in every way."

Up to this time the industry has proceeded cautiously, in the main. Its inventories still are relatively small and well balanced, its cash position is strong and it has no large stocks of finished products.

The period of real temptation seems to be at hand, however. There are indications here and there, especially in the large eastern industrial centers, that sales of motor vehicles, particularly passenger cars of the open type, are slowing up. This slight decline in business may be the result of bad weather or it may be symptomatic of a sharper recession to come. May usually is the best month in the year, in most sections, and it is unusually early for what is known as a "seasonal" decline.

It is entirely safe for manufacturers to go on producing to fill bona fide orders and to

take care of markets actually in sight, but if dealers report a really noticeable falling off in sales it would be foolhardy to continue output at capacity. A reaction might be temporary, but it would be dangerous to go on the theory that it would be and that the rebound would be strong enough quickly to absorb any accumulation of finished products which might result from capacity production while it continued.

Happily there are no indications that automotive manufacturers will proceed along anything but sound lines.

The bottom is not going to drop out of business and there will be substantial sales the rest of the year. They will not continue in the volume attained the first four months nor are they likely to sink to the levels of late 1920.

Some slowing down of industry will be wholesome. The record-breaking speed which had been attained in practically all lines was perilous. If it had continued it would have led inevitably to inflation, over-speculation and unwarranted expansion.

The general credit situation is strong and the cautious attitude of business men makes real credit difficulties improbable. In the automotive industry there is no disposition to expand plants or make speculative commitments. The business situation does not contain the unlimited possibilities of expansion and profits which some short-sighted optimists thought they saw early in the year, but it is infinitely better and stronger than it has been at any time since 1919.

There is no substantial ground, and there has been none, for expecting an intense, long-continued boom with conditions in Europe as unsettled as they are today. Fortunately, economic equilibrium is being restored there more rapidly than seemed possible only a short time ago and the volume of our exports, especially automotive, is expanding rapidly. This recovery will tend strongly to take up the slack if there is a real decline in domestic demand.

The automotive industry has contributed its bit to the prevention of a disastrous period of inflation by refraining from a mad race after materials and labor and by keeping the prices of its products at a reasonable level. Unless it abandons its policy of caution, and there is no reason for expecting that it will, the year will be one of substantial profit and real progress toward the stabilization which is so much to be desired.

J. D.

G.M.C. Plans Body Assembling Plants

Will Establish Them at Home and Abroad

President Sloan Tells of Resultant Benefits—Discusses Other Questions

By JAMES DALTON

NEW YORK, May 22—"Within the next two or three years, when anyone speaks of the price of a motor car, the quotation will be on the sedan rather than the touring car as the custom is today."

This was the reply of Alfred P. Sloan, Jr., the new president of the General Motors Corp., to a query as to whether or not he considered the present remarkable demand for closed cars permanent or transitory.

There's no argument about it, in his opinion. The automotive industry must readjust its estimates of what the public wants and bend its production machinery to meet the need which has developed so sharply within the past eighteen months.

"We never have been able to gage demand accurately," Mr. Sloan said, "because we have never been able to meet it even approximately with the production of closed cars we have been able to attain. Much more labor is involved in the making of inclosed models and more time is required to turn them out."

"We have felt that if we were to operate on an efficient basis we must have a very close association with our chief sources of body supply because only in that way could we be assured of satisfactory service."

Will Save on Freight Bills

"It is no secret that we propose to establish body assembling plants in all parts of the world. We shall ship bodies in knocked down form to these plants, there to be assembled, painted and finished so they can be dropped directly onto the chassis. Not only will there be a huge saving in our freight bills, but we will be assured of having the bodies in perfect condition when they are delivered to purchasers. When closed cars are shipped long distances by freight, they almost always are so badly marred they have to be refinished."

Mr. Sloan believes that prospects are bright for an excellent business for some time to come, although a natural seasonal decline is to be expected.

When he was asked what he considered a "normal" year in automobile production, Mr. Sloan laughed.

Business in Brief

NEW YORK, May 24—While the course of general business remains extremely active, with indications of continued progress, there is a decided undercurrent of uncertainty as regards the future of business and prices for commodities. The building trade has shown unmistakably the signs of large inflation. Perhaps the most notable indication of immediate business trend is given in the postponement of building construction in many large cities and the holding up of construction already begun, due to the high level of material prices and labor cost.

Of great import is the announcement by the Department of Commerce that March imports exceeded exports by \$60,800,000. This is the first month since April, 1914, that imports have taken the lead. It is believed that the tide has turned and that outflow of gold from the country will continue, resulting in some reduction of European indebtedness, if only in an indirect way.

Iron and steel production continues at very high levels, permitting the plants to fill their back orders. New orders are not coming in at so rapid a pace. The greatest reduction occurred in steel requirements for the building trades.

Car loadings remain at record level. During the week ending May 5 loadings aggregated 961,029 cars, a falling off of only 2665 from the week previous.

The stock market suffered from the general uncertainties of business. Under pressure of selling a new low record was attained. The bond market for the first time in several weeks reflected a steady demand in advances.

"I haven't the slightest idea," he replied, "and I don't believe anyone has. We never have had any normal years upon which to base conclusions."

One of the chief limiting factors in the sale of automobiles, he believes, will be traffic congestion, especially in the cities. He thinks, however, that scientific regulation of traffic and store door delivery of freight, a service which the railroads should perform, would do much to relieve present pressure.

(Continued on page 1153)

Slowing Up Evident in Sale of Open Cars

Dealers Have Surplus of These Models and Not a Sufficient Supply of Closed

NEW YORK, May 23—In most sections of the country there has been an undeniable slowing up in retail sales of automobiles. There is nothing as yet which approaches a "slump" in business, but it is falling off.

Most of the decline has been centered on open cars and dealers in a good many of the larger cities are having considerable difficulty in disposing of them. The market for closed models apparently is about as strong as ever and sales in this field are limited only by supply.

Used cars are beginning to pile up, although they have been sold in large numbers all the year, and at a few points the demand for them still is good.

Dealers generally believe that manufacturers must revise their production schedules and turn out a preponderance of closed cars. If this is not done they fear an over-production of open models with all its attendant evils.

These facts are disclosed by special reports made by correspondents in Milwaukee, Chicago, Detroit, Toledo, Los Angeles, Columbus, Denver, Indianapolis, Seattle, Kansas City, Des Moines, Minneapolis, Cincinnati, St. Louis, Louisville, Philadelphia, Cleveland, Birmingham, Dallas, Pittsburgh and Boston.

Cities Reporting Conditions

Following is the substance of the reports:

BOSTON—Dealers who were swamped with orders up to the end of April find that sales have slowed up. Buying has not stopped, but it is less active. Prompt deliveries of open models are possible, but persons who have been waiting for closed cars are beginning to cancel orders. Prospects show more of a tendency to shop.

PHILADELPHIA—Most dealers report a slight easing off in sales, although there is a noticeable shortage in the supply of closed models in both new and used cars. The belief has grown in this territory that the time is approaching when there will be an even stronger trend toward the closed car.

(Continued on page 1153)

Haynes, Winton, Dorris May Merge

Individual Identity Would Still Continue

Plants Would Be Operated Under General Name of Consoli- dated Motors

KOKOMO, IND., May 21—Formation of Consolidated Motors, representing an anticipated merger of the Haynes Automobile Co. of Kokomo, the Winton Co. of Cleveland and the Dorris Motor Car Co. of St. Louis, was announced here today.

Directors of the Haynes and Winton companies already have approved the merger and now will submit the proposition to the stockholders for action. Haynes stockholders will act on next Friday and their approval is expected. Stockholders of the Winton company are expected to give their consent on June 4.

Consolidated Motors would be capitalized at \$19,000,000, issuing new stock in return for surrendered stock of the three companies. Back of the merger would be economy of operation, prestige and sale of enough stock to provide a comfortable working reserve, sufficient assets making the issue attractive and profitable. Officers of the present companies would be identified in executive positions with the parent concern.

Companies Would Be Subsidiaries

The plan contemplates continued operation of all the factories of the three companies and the continuance of the three names in the automobile world. The plan of operation would be similar to that of General Motors in this instance, Consolidated Motors being the parent corporation with the three subsidiary companies producing their own distinctive lines of cars.

The plan, however, contemplates a readjustment of the types and price classifications of the three cars, in order to form a well coordinated line of motor vehicles to meet the demands of buyers in all classes. The Dorris is to be the highest priced car in the group. The Winton would occupy a middle ground, and the Haynes would constitute the popular priced group. It is the purpose to build a Haynes for around \$1,000, and one for considerably less to participate in the low priced class.

This proposed merger comes as a surprise to the industry and means the uniting of three of the oldest companies in

State Regulation of Bus Operation Will Encourage New Capital and Aid Good Operating Companies

By WALTER E. PARKER,

President of the Commerce Motor Truck Co.

Detroit, May 22.

DEVELOPMENT of bus transportation in the United States still is in an embryonic state and as such it does offer a specially attractive field for the average truck manufacturing company. There have been one or two instances where truck makers have made successful progress in making buses but as a general rule this business has not been satisfactory.

The principal difficulty with bus operation is lack of finances. Except in a few parts of the country the business is in the hands of men who are nothing more or less than drivers and lack conception of the general management and development of transportation business.

As a general rule the business done with this type of operator does not work out well. Payments are insecure and in many instances are never completed. Because of poor mechanical knowledge and lack of funds to have the proper care taken of the buses their life is speedily exhausted. This is detrimental to the reputation of the manufacturer.

Most of the equipment in use in the bus field today is makeshift in that small truck chassis are being used to carry loads for which they were never designed. One and one and a half ton chassis designed for fast operation are being mounted with bodies which alone exceed the weight carrying capacity and then carry twenty to thirty passengers at high speeds. Chassis cannot stand up under these conditions for more than a relatively short period, especially when they are not put into the shop for long enough periods to be properly serviced.

In some parts of the country, the Pacific Coast, Virginia and Florida, and in some eastern and middle western States, bus routes are being operated by well financed and well managed companies and are doing successful business. The greater part of the bus business today, however, is in improper hands and cannot develop under the circumstances.

No great development of bus use by interurban railway companies can be looked for in the immediate future because most of these are laboring under financial difficulties which makes it impossible for them to go in for bus operation. Entirely new companies are needed, amply financed to permit of a general transportation organization, before the bus business can be established generally on a firm basis.

There is a growing movement throughout the country to put bus operation under the regulation of state utility commissions and this will have the effect of encouraging new capital to come in. Without regulation it has been possible for anyone to buy a bus, select a route over which they care to operate, and proceed. Regulation will prevent crowding off good companies by individuals attracted by the possibility of making easy money after development work has been done.

Factories to make a success of the bus business must be equipped to specialize in this form of production. There is no standardization on bus design and individual operators have special requirements which makes it difficult for the truck maker to get satisfactory results. The bus specializing factory should be well enough financed also to permit of a basis of payment from operating profit, in much the same way that railroad equipment is bought.

the business, if the deal is consummated, which now seems likely. Elwood Haynes, Alexander Winton and George P. Dorris all in the same family is something to marvel at, each of them a pioneer and with the industry from its start.

The records show the incorporation of the Haynes Automobile Co. as of May 16, 1898, but the Haynes car was out before that. Haynes still is president, with A. G. Seiberling as vice-president and general manager and G. U. Radoye as director of sales. The company is

incorporated for \$4,000,000 common, \$2,100,000 7 per cent cumulative preferred and \$600,000 preferred, par \$100.

The Winton Co. was incorporated March 15, 1897, with a capital stock of \$1,000,000 common and \$1,500,000 7 per cent cumulative preferred at the present time. Prior to manufacturing automobiles, the company made bicycles. Alexander Winton claims to have sold the first American built automobile twenty-five years ago.

(Continued on page 1149)

Firestone Tire Quits Rubber Association

President Disagrees with Policy Adopted Toward British Restriction Act

WASHINGTON, May 21—The Firestone Tire & Rubber Co. of Akron, has resigned its membership in the Rubber Association of America, Inc., it was announced today by President Harvey S. Firestone, who is maintaining offices here to carry on his fight against the Stevenson Restriction Act and to develop rubber in the United States or its possessions.

The policy adopted by the Rubber Association as regards the British restriction act is the reason given for the resignation of the company which carries with it Firestone's retirement from the board of directors of the Rubber Association, an office he had through having been a former president of the association.

Failed in Crisis, He Says

Giving his reasons for the resignation, Firestone said:

In behalf of the Firestone Tire & Rubber Co. I hereby tender, for the attention of your board of directors, its resignation as a member of the Rubber Association of America. This action is taken only after mature consideration and with the greatest reluctance. The failure of your organization to cope with the major problems of the association, especially the crisis created by the Rubber Restriction Act, has impelled this action.

In the beginning this company called your attention to the laws and has ever since urged you to action. You appointed a committee to confer with the rubber growers. We protested that this would be a waste of time. Months have elapsed—the rubber growers have reported urging more strict enforcement of the laws. Nothing has been accomplished.

Feeling this would be the result we have been doing everything in our power to bring about a protest to the British Government through the proper channels available. We have not had your cooperation. We have had only your continued opposition.

Charges Lack of Cooperation

Immediately after the failure of your negotiations with the rubber growers, the writer appeared before your board and asked their cooperation with the work outlined by the Washington conference. You unanimously refused and circularized your membership to that effect. You withheld from your membership notices of the fact that at the same meeting in my absence, you were unanimously of the opinion that Secretary Hoover's suggestion of a rubber buying organization to combat the British monopoly of rubber production "would be unwise and ineffective." Nor did you advise your membership that at the same meeting you appropriated \$5,000 of the association's funds to employ a publicity agency to use the trade papers and general press to "quiet any mis-

NASH EMPLOYEES GET "RECREATION PLANT"

KENOSHA, WIS., May 21—A factory "recreation plant" representing an investment of \$150,000 has just been dedicated by the employees of the Nash Motors Co. at the main works in this city. It is the gift of the company to its workers.

The baseball park and athletic field cover ten acres and embraces a steel grandstand seating 2618 persons, with bleachers holding 2000 additional. There also is a large clubhouse, in two distinct sections, one for men and the other for women. Each has a large lounge, locker rooms, a complete kitchen and dining room. Alongside are tennis courts, children's playgrounds, handball court and other recreation facilities.

The Nash company has put into the field a semi-pro baseball team which consists of some of the best known stars outside of major leagues, and which is now engaged in playing a season's schedule which takes it into most of the large cities of the country.

apprehension" that existed as to the Rubber Association's viewpoint on Restriction Laws:

The United States Government has recognized the problem as vital, affecting both our peace prosperity and war security, and has appropriated a substantial fund for the investigation of a safe and adequate source of supply.

This company desires to do everything in its power to further this worthy project and to continue the agitation for the repeal of the British laws. We have been aware of your opposition, even of your direct appeal to the membership to have nothing to do with our efforts, but when you employ the funds of the Association—a substantial portion of which this Company contributes—to actively oppose by systematic and organized publicity our efforts to secure the repeal of the laws and better conditions for the rubber industry and the consumer of rubber products, there remains no choice.

British Plans Unchanged

NEW YORK, May 21—There is no present intention on the part of the British of modifying the regulation plan of restricting crude rubber exports, according to authoritative advices received by the Hotchkiss committee of the Rubber Association of America, which is handling the negotiations with the Rubber Growers Association.

The committee declared that the recent trend of prices lend color to the Rubber Growers Association assertion that there is an abundance of rubber to meet immediate requirements. It adds that "it is by no means certain, however, that this will be the case in six months' time, if American consumption continues as during the early part of 1923."

(Continued on page 1155)

Premier Purchaser to Operate Factory

Bid of Frederic L. Barrows, President of New Premier Motors, Accepted

INDIANAPOLIS, May 22—A bid for the purchase of the plant and assets of the Premier Motor Corp. was accepted by the Fletcher Savings & Trust Co., receiver, yesterday and later was approved in court by Judge Lynn D. Hay. In order to allow time for giving notice to creditors, Judge Hay will wait five days before entering the final order of the sale.

The bid was filed by Frederic L. Barrows of Connersville, Ind., in conformity with agreements previously made between the Premier organization and the creditors' committees. It included \$250,000 cash, lien notes to the receiver and turning over to the receiver of 25,000 shares of stock in Premier Motors, Inc., which has been organized as a successor company, to be distributed to creditors of the Premier Motors Corp. The plant was appraised by the American Appraisal Co. at \$2,300,000.

Schaeffer to Be Active Head

Premier Motors, Inc., will have Barrows as its president, with Ivan A. Schaeffer, secretary of the old company and in charge of the plant under the receiver, as vice-president and active head. Its capital stock will consist of 100,000 shares of no par value, half of which will be held in the treasury for the present.

The new board of directors will consist of five men. Two, to be nominated by the old reorganization committee, probably will be J. D. Sutherland, general sales manager of Wyman Gordon Co. of Cleveland, and Blaine Miller, president of the American Foundry Co., this city. Arthur Dixon, recently vice-president and general manager of Ansted Motors, Connersville, will be the fourth director and the fifth will be a prominent automobile distributor.

Plans have been announced for continuing operations of the Premier plant in the production of Premier passenger cars and the development of the manufacture of a taxicab of a design already perfected.

Taxicab Orders Pending

The taxicab was designed and developed under the receiver and it is said that the final signing of orders for large numbers of them by an Eastern concern, which has approved the cab after thorough tests of sample jobs, is but a formality. As soon as these orders are signed, the working force at the plant will be increased to at least 500 men. The price of the Premier car, which is said to be too low, will be continued for the present. The receiver is said to have developed engineering plans that will be of great value to the new concern.

Hispano-Suiza Forms New French Company

Will Market Two Lighter Models
of Cars and Add Several
Aviation Engines

PARIS, May 12—(By Mail.)—Arrangements are being completed for the formation of a French Hispano-Suiza company, with a capital of 36,000,000 francs, having the same technical staff and factory as the present private company, the capital of which is mostly in Spanish hands. Marc Birkigt will remain as chief engineer.

With the formation of the new company announcement is made that Hispano-Suiza will market two new models: a four-cylinder chassis of 122 cu. in. piston displacement, rated at 12-14 hp. and a six-cylinder of 183 cu. in. piston displacement having a nominal rating of 18 hp. Two new aviation engines are also being prepared, one of them being a six-cylinder of 450 hp. and the other an eight-cylinder of 600 hp.

Before the war Hispano-Suiza specialized in sporting type cars of small piston displacement, but after the armistice changed to a single high-powered model which is the most costly car on the French market. By adding two smaller models the company has come into line with others who have found it impossible to keep their factories running on a single type high-grade car.

Ford Output This Month Will Aggregate 170,000

DETROIT, May 18—Ford Motor Co. output in May will aggregate 170,000, running 120,000 short of its demand from dealers, which will total about 290,000. June production will be stepped up slightly, despite the fact that facilities at the main plants and at the assembly branches are already taxed. Requests from dealers for June will run about 305,000, the factory estimates from orders already received.

All of this business is under regular sales plans, the weekly payment movement being too new to have any effect on orders placed at the factory. Enrollment of buyers under the weekly plan is proceeding rapidly, and an announcement soon will be made from the factory showing the actual number of persons subscribing in the early stages of the movement. Delays in getting the plan under full swing in all sections of the country have been experienced, but are now squared away.

Ford's High Weekly Output

DETROIT, May 16—The Ford Motor Co.'s domestic production of cars and trucks reached a new high mark in the week of May 15 of 39,303, an excess of 250 over the week before, which had been the best previous week. May 9 with 6615 cars and trucks set a new

WISCONSIN REQUIRES FENDERS ON TRACTORS

MILWAUKEE, May 21—"No tractor shall be sold in the State of Wisconsin which is manufactured from and after Jan. 1, 1924, unless the drive wheels of such tractor shall be protected with suitable fenders." This is the text of an amendment passed by the State Legislature and approved by the Governor to a law enacted in 1919 which says: "No wagon or other wheeled vehicle, except animal-drawn pleasure vehicles seating less than eight persons, having metal tires less than three inches in width, shall be sold in the State of Wisconsin from and after July 1, 1920."

daily high mark. Tractor production during the week totaled 2940. Lincoln production was 185.

Hood Last Year Earned \$12.89 Share on Common

BOSTON, May 21—For the fiscal year ended March 31, 1923, the Hood Rubber Co. shows net available for common dividends equivalent to \$12.89 a share. Interest on the \$6,000,000 7 per cent debenture notes and dividends on the \$4,550,000 of Hood Rubber Co. preferred stock were each earned more than five and one-half times over last year. Dividends on the \$1,000,000 of Hood Rubber Products Co., Inc., preferred stock were earned over three and one-half times. Sales amounted to \$28,180,807, the largest in the company's history.

The consolidated condensed balance sheet of the Hood Rubber Co. and the Hood Rubber Products Co., Inc., show total current assets of \$14,929,580 as against current liabilities of \$1,537,616, leaving \$13,391,964 of net working capital as compared with \$12,323,970 at the close of the previous year. The ratio of quick assets to quick liabilities March 31 was 9.71 as compared with 3.74 at the close of the 1922 fiscal period.

AUTO-LITE TO OPEN FOUNDRY

TOLEDO, May 19—The Electric Auto-Lite Co. has asked the Fostoria Pressed Steel Co. to vacate the large gray iron foundry which has been occupied by the steel company as a storage place for many months. The foundry was erected by the Willys Corp. about two years ago, but has never been operated. Word from Fostoria is to the effect that it will probably soon be placed in operation.

MITCHELL DEBTS \$3,960,240

MILWAUKEE, May 21—According to a schedule just filed, the liabilities of the bankrupt Mitchell Motors Co., Inc., of Racine, aggregate \$3,960,240, while the value of the assets is placed at \$3,742,722.

Northway Is Elected S. A. E. Section Head

New England Meetings Hereafter
Will Alternate Between Boston
and Springfield

SPRINGFIELD, MASS., May 21—Ralph E. Northway was elected chairman of the New England section of the Society of Automotive Engineers, at the section's final meeting of the season. H. E. Morton of Sturtevant Blower Works, the outgoing chairman, presided at the meeting, which was attended by forty members. Following the business session, Northway gave a talk on automobile springs, spring suspensions and spring materials, the United States Department of Mines' film, "Alloys of Steel," being shown at the end of the talk.

It was voted that meetings during the coming year should alternate between Springfield and Boston, the opening meeting to be at Hotel Buckminster, Boston, at a date in September to be determined later. It is planned to have the New England section well represented at the society's summer meeting.

Officers elected in addition to Northway are: Vice-president, E. O. Sutton, Knox Motors Co.; secretary, V. E. Neilson, V. A. Neilsen Co., Boston, and treasurer, Linwood H. Young, Boston.

Dr. Mathews Speaks in New York

NEW YORK, May 21—Dr. J. A. Mathews of the Crucible Steel Co. was the chief speaker at a well-attended meeting of the Metropolitan Section of the S. A. E., held at the Automobile Club of America. Dr. Mathews emphasized the point that for any given application success is more dependent upon freedom from impurities than the particular analysis of the steel.

C. H. Landon of the American Bronze Co., in an illustrated paper, dealt very thoroughly with the micro-structure of various types of bronze, explaining the effects of both hot and cold working and heat treatment.

Three reels of moving pictures on the subject of steel making, which were provided by the Bureau of Mines, concluded the program.

Overland Makes Record With 1026 Built May 14

TOLEDO, May 19—Willys-Overland Co. established a new day's record of production when 1026 cars were turned out at the factory here on Tuesday, May 14. It is reported that the new "Red Bird" is meeting with an enthusiastic reception.

Fifty trained sections are now at work at the plant in the drive for skilled workers. In the radiator section already forty men have been graduated into regular work in the factory. Almost every one of the semi-skilled tasks in the shop is now taught to beginners.

Rickenbacker Limits Open Car Production

Will Build Only on Order, Centering Activities on Closed Models

DETROIT, May 23—With a continued dwindling in demand for open cars the Rickenbacker Motor Co. has sent out instructions to its distributors that it is placing manufacture of its cars in this class on a direct order basis, and will maintain its regular production run on closed cars exclusively. This means that the only open cars built by the factory will be on direct specifications from distributors filed about thirty days in advance.

Open Car Demand Declines

In making this radical step the company declares that sales conditions, in so far as its own line is concerned, fully warrant it. Sales today at what should be the height of the open car season are running approximately 80 per cent closed, with open car demand steadily declining. Rather than take chances on building models not readily salable by its dealers in another month or more, it is confining open car building to the new sales basis.

Though the action of Rickenbacker is radical so far as the industry generally is concerned, it marks a definite condition, which all dealers are facing more and more all the time. In Rickenbacker's case it is due more to extreme partiality for its closed models, which it has featured from the start. In practically all other medium priced lines, however, even where no attempt has been made to feature closed models, the demand is running in excess of 65 per cent closed.

In Rickenbacker's case the practical specialization in closed cars will mean somewhat lower production, as it will mean in the case of any factory which builds closed cars only. This is due primarily to the greater time necessary in the building and the consequently reduced operating space. In taking its action, the company declared that its intention is to build only the type of cars the public demands and not to attempt to force sales of other models.

Other Factories Reduce

Reduced production is reported in the case of several other factories whose business has been built largely on open car models in the past, and whose supply sources on closed models are inadequate to take care of existing demands. In each of these cases it is reported that the danger existed of loading dealers up with slow-moving open cars and, to avoid this, production was cut to the minimum to push closed model output.

There has been some laying off of men in these plants because of reduced output, and in some other factories employees have been laid off owing to over-

production in certain departments. Factories with ample closed body supply, and those specializing in special open body styles, report no cuts in production will be made for at least the balance of this month.

The Ford Motor Co. created a new production record in the week ending May 22 with an output of 39,417 cars and trucks for domestic use, exceeding the week before by 114.

Monday this week was the largest single day to date, with 6658, a gain of forty-three over May 9. Tractor production for week totaled 2996, and Lincoln output was 147.

Chevrolet produced 1820 cars yesterday and 1620 on Monday.

344,379 Cars, 37,366 Trucks Built in April

WASHINGTON, May 23—Production figures compiled by the Bureau of the Census show that 344,379 passenger cars and 37,366 trucks were produced in April, the increase over March amounting to 25,955 passenger cars and 2763 trucks.

Compared with passenger car output in April, 1922, the increase in April of this year amounted to 147,163 cars. Statistics issued today show two revisions over last month's report. Corrected figures for truck production in March, 1923, place the total at 34,603 and those for January at 19,398.

The figures for the first four months of 1923 show that 1,141,159 passenger cars were manufactured, an increase of 600,120 over the same period for 1922. The output of trucks for the first quarter of this year totaled 113,182, an increase of 84,468 over the period of last year. With few exceptions the reports each month are from identical firms and include approximately ninety passenger car and eighty truck manufacturing firms.

New Country Club Model Built by Willys-Knight

TOLEDO, May 24—A new country club model priced at \$1,635 has been brought out by Willys-Overland, Inc.

The car is of the sport type and has unusually complete equipment, including five Fisk cord tires oversized 32 x 4½, five disk wheels, Brussels floor carpets, front and rear, double bar bumper in front, windshield wings, automatic windshield wiper, eight day clock, electric gasoline gage on the rear, trunk bars, scuff plates on the running boards, motor, windshield visor, and the trimmings are of nickel.

The upholstery is Spanish morocco and the top is khaki with red bindings and welts.

LINCOLN TIRE BANKRUPT

FREEMONT, ILL., May 19—The Lincoln Highway Tire Co. of Fulton, Ill., has filed a petition in bankruptcy, listing liabilities of \$120,267 and assets of \$97,887.

Republic Tire Plant Sold to Lee Rubber

Latter Is Holding Company Which Has Formed Nucleus for Big Organization

NEW YORK, May 22—Through the purchase of the Republic Rubber Co. of Youngstown, Ohio, from the creditors, the Lee Rubber & Tire Corp., a holding concern, which already controls the Lee Tire & Rubber Co. of Pennsylvania, has taken a definite step ahead in its aim to bring under its banner a number of productive tire manufacturing companies.

Ultimately it hopes to add to the nucleus already established other concerns of this character, that being the purpose for which it was formed five years ago. Since that time it has been moving cautiously, and the purchase of the Republic is the first important step in this direction.

Stockholders to Act

Details of the Republic deal will not be given out until the stockholders of the Lee Rubber & Tire Corp. pass on the purchase made under the direction of John J. Watson, Jr., chairman of the board of the Lee corporation. This meeting has been called for June 6 for the purpose of approving an increase in the capital stock from 150,000 to 300,000 shares of no par value. It is said that payment for the Republic will be made in stock in the Lee corporation, and that none of the increased issue will be offered for sale.

It is also said that Republic and the Lee Tire & Rubber Co. of Pennsylvania will be operated as separate and independent concerns, each being under control of the corporation.

Watson, as head of the Lee corporation, is a man of vision, as his record in the rubber industry shows. Prior to his present Lee connection he was treasurer of the United States Rubber Co. and president of the Rubber Goods Manufacturing Co., which is a United States Rubber Co. subsidiary. It is said that it was Watson who first interested the United States Rubber Co. in establishing its own rubber plantations.

Receiver Has Been in Charge

The Republic Rubber Co. has been run by a receiver, C. H. Booth, for several years, becoming involved financially in 1918 because of large commitments for fabric and rubber which it was unable to liquidate because of a declining market. Under Booth a complete reorganization in the company's personnel and methods of manufacturing and distribution was effected, and as a result the company has been prospering as shown by its report of sales for March, 1923.

Under the new management Republic will continue to manufacture the old Republic products.

Control of A. A. A. Goes to Middle West

Harmony Marks Annual Meeting —Association Reported in Excellent Condition

NEW YORK, May 23—A complete change of administration was made at the annual meeting of the American Automobile Association, held in this city yesterday by which control of the National organization passes to the Middle West through the selection of Thomas Patrick Henry of Detroit as president, Roy Hill of Minneapolis as secretary and W. C. Kirby of Chicago as treasurer.

It was an amicable meeting, in marked contrast to the session at St. Louis last year when there came a split in the ranks, resulting in the withdrawal of ninety-five clubs and the formation of the National Motorists Association as a rival to the A. A. A. George C. Diehl led the forces of the older organization so successfully following this defection that when he retired from the presidency yesterday after two years' service, he left behind him a national body that apparently had healed all its wounds.

Officers Report Progress

Harmony was the keynote and the reports of the retiring officers showed wonderful progress. The A. A. A. is reported stronger than ever both financially and numerically and the Henry administration starts in with brilliant prospects. The meeting declared the Diehl administration a decided success and did not hesitate to say so.

There was no opposition to the slate reported by David Jamieson as chairman of the nominating committee and the following ticket was elected:

President, Thomas P. Henry, Detroit; secretary, Roy Hill, Minneapolis; treasurer, William C. Kirby, Chicago; vice-presidents, Charles A. Frazer, Massachusetts; P. J. Walker, California; Frank S. Gould, Minnesota; Frank Miller, Florida; C. H. Verschoyle, Texas; L. S. Coulter, Ohio; and Dan Reese, Pennsylvania.

Executive Committee: M. A. Keyser, Utah; P. N. Milner, Louisiana; Alfred Reeves, New York; Cecil R. Rood, Ohio; W. H. Laller, Ohio; Harvey Meyers, Kentucky; A. H. Frebach, Ohio; Colonel Azel Ames, New York; Arthur Flfoot, Connecticut; C. B. Nichols, Ohio; H. A. Bonnell, New Jersey; and S. S. Gorham, Illinois.

Henry Represents D. A. C.

The selection of Henry as president is taken to mean that the automobile manufacturers will take more interest in the A. A. A. than ever before, because Henry goes in as a representative of the Detroit Automobile Club, which is the mouthpiece of the industry in Detroit and in which Roy D. Chapin, William E. Metzger, Sidney Waldon and others play a prominent part. Henry is a director and also has been chairman of the Touring and Transportation

Board of the A. A. A. A former New York newspaper man, he now is one of the leading manufacturers of linotype machines in the country.

A feature of the election was the retirement of H. A. Bonnell, treasurer, who has filled that office for the past 15 years. Pressure of personal business brought about Bonnell's retirement and it was with regret that his name was omitted from this year's slate.

Roads, legislation and touring naturally figured in the discussions and brought out just what a prominent part the A. A. A. plays in the enactment of just laws and advancement of the cause of the highways. Secretary of Agriculture Henry C. Wallace came on from Washington to tell the motorists what the Government is doing with Federal Aid.

Many New Roads Built

Secretary Wallace said that up to March 31, 21,368 miles had been completed at a total cost of \$378,087,845, and the Federal share of the cost, amounting to \$160,938,223, had been paid to the States. On the same date 3413 miles additional had been completed but they had not been inspected for final acceptance. The total cost of these roads was approximately \$51,500,000. The total mileage completed or under construction on March 31 was 39,062 miles.

Reporting on the work of the A. A. A. Good Roads Board, Chairman H. G. Shirley stated that "while great progress has been made in connected highway building during the past year, the attitude of the public mind toward the expenditure of public money for the building of roads as mirrored in the action of the General Assemblies has not kept pace with progress made in road building. On the contrary much legislation enacted by several of the states was of a decidedly reactionary nature."

Percy E. Towne of San Francisco, reporting for the Legislative Board, declared that there is a dangerous passivity existing among motorists regarding the tax or the way it is levied, due to the fact that the demand is so great for improved highways over which the motor vehicle can operate that they willingly submit to any sort of legislation in the hope that it will produce more miles of road.

Tell of Tax Experiences

Without desiring to go on record one way or another as to the advisability of a gasoline tax, a lively discussion started when Robert P. Hooper of the Pennsylvania Motor Federation told how Pennsylvania motorists had defeated legislation which would have jumped the fuel tax from one to three cents. S. D. Waldon of Detroit was opposed to such a tax and told how Michigan beat it.

Clark Cottrell, manager of the Good Roads Bureau of the California Automobile Association, took the opposite tack, declaring that in his State the gasoline tax was favored as an ideal medium for metering the use of the highways. However, the Californians favor such a tax when it replaces all other taxes.

New York Railways Orders Motor Buses

Brockway to Build Gasoline and Trolley Vehicles for Rochester and Utica

ROCHESTER, N. Y., May 21—The New York State Railways has placed an order with the Brockway Motor Truck Co. of Cortland, N. Y., for seven gasoline propelled motor buses and five electrically driven trackless trolley buses to be used on crosstown lines in this city and Utica, it was announced at the general offices here today.

Both the gasoline buses and the trolley buses will have practically the same dimensions and capacity, the only difference being in outward appearance and source of power.

The buses will have a seating capacity of twenty-five, with two rows of seats facing forward, with an aisle between and side seats in front. The bodies will be constructed by the G. C. Kuhlman Car Co.

Sewell cushion wheels and Overman cushion tires will be used on both types of bus.

The gasoline buses will be driven by four-cylinder Buda engines. Two 25-hp. General Electric motors will furnish the power for each trolley bus. General Electric will also furnish all other electrical equipment used on the trackless trolley.

Haynes, Winton, Dorris Companies Talk Merger

(Continued from page 1145)

The St. Louis end of the merger, the Dorris Motor Car Co., was incorporated Dec. 1, 1906, with George P. Dorris as the dominant figure. Dorris started to build his own car after having successfully launched the old St. Louis.

The three cars are somewhat close as to price, Dorris retailing at \$3,950 for its open car, Winton at \$3,600 and Haynes at \$2,500.

Winton Directors Approve

CLEVELAND, May 21—Directors of the Winton Co., manufacturer of the Winton car, met this afternoon at the plant in this city and approved the proposal for the consolidation of the Winton Co. with the Haynes Automobile Co. of Kokomo, Ind., and the Dorris Motor Car Co. of St. Louis.

The directors, after listening to the offer that had been made, voted to recommend to the stockholders of Winton that the proposal be accepted. The board called a special meeting of the stockholders, to be held June 4, at which time final action will be taken. With the board of directors and those active in the management of Winton in favor of the proposal, it is likely that holders of stock will give their approval.

April Output Figures Show Total of 380,000

Car and Truck Production for
Four Months of Year Ag-
gregates 1,252,565

NEW YORK, May 21—Revised figures place production of automobiles and motor trucks during April at 380,000 instead of 364,000, which was the conservative estimate announced at the close of the month. For the first four months of the year output had reached 1,252,565, or more than double the production of 605,653 in the similar period a year ago. June of last year, with a total of 289,011, was the only month in the production history of the industry to approach April in output.

During the first week of May, for which reports are now available, production of cars was running 5 per cent above the first week of April, advices indicating, however, that output was in advance of shipments. This would point to some stocking of finished products by the manufacturers.

From all indications sales throughout the country are good, with the demand especially strong for closed cars. Such stocks as dealers have on hand are largely of open models, the accumulation being due in a measure to local climatic conditions.

It would not be surprising to find a slackening in manufacturing operations coming at almost any time owing to the desire of producers to bring schedules to a point where they would offer a regular operating program to be followed throughout the year. This would insure steady operations during the usually dull season. Such a paring off would not mean retarded sales as it would indicate the tendency of the industry against over-production. The industry as a whole has guarded itself against undue expansion of manufacturing facilities.

Truck Makers Cautious

Caution is notably manifested in truck manufacture where parts releases are being authorized on the actual sales prospects in an effort to avoid the piling up of finished goods inventories. Truck demand continues in good volume, keeping pace with general business and industrial conditions. Farmers are buying well and commercial centers are increasing their purchases. The moving up of schedules is gradual, governed not only by the demand in the motor truck field itself but by the rapid development of motor bus and rail car use.

FORD MAY PURCHASE FACTORY IN NORFOLK

NORFOLK, VA., May 23—A series of brick warehouses containing about 1,000,000 sq. ft. of floor space and located on the waterfront near Norfolk, is being put into condition for occupancy, and it is understood that Henry Ford will purchase the property for use as an assembling plant and an export center. The buildings are now owned by private interests in Norfolk.

Edsel Ford, accompanied by other representatives of Ford interests, has been in Norfolk on a tour of inspection during the past month. Owners of the warehouses, which are situated near the Navy Yard, have been in conference with the Ford representatives.

The year will see a marked expansion in the truck branch of the industry.

Parts makers are maintaining their strong position because of the high operations followed in car and truck manufacture. Collections show little deviation from previous levels. Body builders continue on a capacity basis and are unable to make immediate deliveries. The heavy demand for the closed type of car has kept manufacturers operating at top speed, and so long as the demand continues there is no likelihood of any let-up in operations.

Syracuse Gear and Parts Plants Working Overtime

SYRACUSE, N. Y., May 23—Gear and automobile parts factories in this city are working overtime, with some handicapped by a shortage of labor. While this fact is reducing production to a certain extent, the plants are doing the biggest business since the war.

The Owen-Dyneto Electric Corp. has obtained a large contract for the manufacture of starting and lighting systems for the Packard. The plant is now producing 100 complete starting and lighting sets each day. The contract is said to run indefinitely.

The Adams Axle Co., which is to open a plant here June 1, has already started recruiting labor.

FEDERAL TRUCK TALKS SALES

DETROIT, May 19—The Federal Motor Truck Co. has held a three-day convention of its national sales division when plans were made for extensive development in this field. The meeting was attended by R. J. Schler of New York, H. C. Allison and E. R. Frech, Chicago, Myles E. Ewing, manager of the department, and Ward W. Mohun of the export division.

Makers See Demand Peak for 1923 Near

Wisconsin Manufacturers Deter-
mining Potentialities for
Rest of Year

MILWAUKEE, May 21—Keeping production sustained in the face of a growing shortage of labor, and making deliveries as near to contract specifications as conditions permit, are the two main problems of manufacturers of automotive units, parts and equipment. There is little or no hope of any relief from the pressure until July 1 or later, when contracts for the new season will be made. No intimations have come to hand to signify if these will demand as much or more capacity than is now employed to the utmost.

Passenger car builders in this district as a rule are satisfied to keep output at maximum rates, limited only by the capacity of plants and the supply of labor, while the demand continues to exceed output to a material degree. In some quarters it is felt that the peak of demand for this year, so far as it works back to factories, is about to be reached. Means are already being taken to determine the potentialities of demand for fall, winter and the spring of 1924, which will form the basis of production schedules after July 1 and Aug. 1.

Indicative of the strong demand for passenger cars in this district is the statement from the office of the Secretary of State of Wisconsin that, while registrations are being filled at the rate of 5000 daily, the office is three to four days behind with work. This condition set in about the middle of April and has grown steadily worse.

Motorists Being Checked

It may be discounted, but only to a very small extent, by the fact that the authorities are engaged in a State-wide campaign to check up on motorists who are still operating on 1922 licenses. The number of these is very small, however. Up to the middle of May 334,000 licenses had been issued, compared with 361,000 for all of 1922.

Local dealers have experienced a steady increase in sales and believe the peak of the load is yet to come, judging by the continued upward trend of the sales-curve. Deliveries are the heaviest that have ever been known, but dealers are still behind on orders for practically all models, and especially on closed types. Distributors are forced to allocate their supplies to keep peace in the family and are using every known means to facilitate deliveries from factories.

CADILLAC GAINS 25 PER CENT

DETROIT, May 19—Cadillac Motor Car Co. reports that shipments during April were more than 25 per cent greater than the best previous month the company has experienced, while deliveries to owners eclipsed all monthly records.

Bank Deposits Show Alabama Prosperous

Road System Being Developed— Much Will Depend on New Cotton Crop

BIRMINGHAM, ALA., May 22—Prospects for the entire State of Alabama being a continued greatly improved market for automobiles seems to be excellent. The increase of 30 per cent in deposits in the State banks between March 10, 1922, and April 30, 1923, and the \$9,000,000 being spent on the construction of 622 miles of roadways at present by the State Highway Department are two of the most convincing arguments in support of excellent prospects.

Three hundred and fifty-four banks and twenty branches are included in the report of the State Banking Department. These banks are capitalized at present at \$12,325,600; on March 10, 1922, they were capitalized at \$11,469,166. From the total capitalization it will be seen that they are the small rural financial institutions of the State, as the average capitalization is less than \$35,000.

Farmers' Condition Indicated

The conditions reported in these banks is an excellent indication of the financial status of the farmers and the smaller industrial sections of the State. Savings deposits increased from \$27,000,000 to \$35,000,000; demand deposits from \$53,000,000 to \$79,000,000. Loans and discounts increased from \$77,000,000 to \$90,000,000, and cash in vaults from \$3,500,000 to \$4,500,000. Bills payable and rediscounts decreased from \$6,500,000 to \$2,900,000. Other liabilities increased from \$165,000 to \$740,000.

The larger banks throughout the State have had almost as good increases on the whole and in some instances better. The six leading banks of Birmingham showed an increase of \$3,300,000 in deposits between calls on Dec. 29, 1922, and April 3, 1923. That an increase should be registered at all during this period is remarkable, as on Dec. 29, 1922, the banks were loaded with holiday deposits on account of the enormous Christmas trade. The December call showed deposits in these banks of \$66,393,000, and on April 3, \$69,696,000. Since that time further increases in the deposits of Birmingham banks have been noted, but aggregate figures are not obtainable at present.

Owe Fewer Debts

"Alabama farmers are entering the new season owing less and needing less, and the banks are in better shape to extend credit," said F. W. Gist, State and Federal statistician for agriculture, during April. This statement could be extended with even more optimistic observations for the industrial sections of the State.

CONTRACT THAT FIXES SELLING PRICE UPSET

TOPEKA, KAN., May 19—The Supreme Court of Kansas has held invalid a distributor's contract with a tractor manufacturer because the contract fixed the price at which the distributor was to sell the tractors. The court declared such a provision was contrary to the State anti-monopoly law.

The distributor, Charles G. Mills, had a contract for the sale of tractors in a specific territory. He filed suit against the manufacturer, alleging that the manufacturer had made direct sales of tractors in that territory at prices lower than those named in the contract. The trial court held that his contract was illegal and denied his plea for damages. This decision was upheld by the State Supreme Court.

It is evident that there is still money in Alabama which could be used for the purchase of automobiles both in the farming and in the industrial sections.

Standing at the bottom of the list in the statistics of the number of automobiles owned to the number of people, or one car to 26.68 persons in the State on Dec. 31, Alabama must have some reason when the basic conditions are as good as they now are.

The first reason is the condition of roads. When the State bond issue of \$25,000,000 to match Federal aid for roads was passed on Jan. 30, 1922, Alabama roads were in very poor shape. Since that time 450 miles of Government aid roads have been completed at a cost of approximately \$4,000,000. Today 622 miles of additional Federal aid roads are under construction, together with two bridges at a cost of \$9,000,000.

(Continued on page 1158)

Stoughton Makes Bodies for Chevrolet Chassis

JANESVILLE, WIS., May 21—The Stoughton (Wis.) Wagon Co., which for the last two years has developed a large business in making cabs and truck bodies for Ford cars, has leased a large building near the Chevrolet plant at Janesville, and is starting production on commercial car bodies designed for application to Chevrolet business chassis.

C. H. Cox, until now associated with the Fisher Body Corp. works at Janesville, is manager of the branch of the Stoughton company. The Chevrolet plant, beside reaching a schedule of 275 cars a day at the close of last week, is putting out 300 commercial car chassis in May and has a schedule of 200 for June production. By the end of June it is believed that passenger car output will have passed the 300 mark per day. Initial production was started in February.

Industry Watching Mid-West and South

Car Makers Expect Best Sales Market for Last of Year to Be Developed There

DETROIT, May 18—The wheat and cotton districts of the Middle West and South are being looked to by factories to furnish the largest automobile sales market in the latter months of the year. Present conditions in these districts are reported to be very favorable for large crops, and the general attitude of dealers and distributors is that there will be heavy buying if harvesting and marketing are possible under conditions as favorable as forecast today.

Manufacturers in the medium priced lines declare the South generally to be in unusually good condition. Low priced cars are selling in quantity and there is a good demand for the better lines. Conditions at the moment are somewhat slower in the Middle West, although dealers are doing good business.

Closed Cars Sell Best

In several instances where closed models are specially low-priced or otherwise popular immediate business in low priced cars is running from 80 to 90 per cent closed car, and all through the medium priced field closed car sales are in excess of 65 per cent of the total. As a result of the popularity of closed models, deliveries in most cases are subject to a month's delay.

With the growth in popularity of the closed vehicle, and the preference of buyers for closed cars at low price, manufacturers are giving steady attention to efforts to reduce the differential in the two types of cars. Dealers are especially anxious for models of this type because of the growing disposition of buyers against putting a lot of money into the body of a car, where the chassis in both types is identical.

Demand for closed cars is most accentuated in lines in which there are none of the popularly styled sport models to capture attention. Manufacturers who started in to build sport cars to meet a part of the buying demand are finding sales in these models to be far higher than expected, and in some cases outdistancing the regular models despite the price difference. This is especially true in the sport roadsters.

Style Models Suffer First

The dressing up of closed models by adding special features such as nicked radiators and drum lights, together with optional paint work, has developed a new field of specialized demand. Manufacturers are capitalizing on the demand for individual car styles and are confident that there will be good business in these styles as long as the country is generally prosperous. With a falling off in general business the style models will suffer first, it is conceded.

Men of the Industry and What They Are Doing

Dinner Given Hardy

A. B. C. Hardy, president and general manager of the Olds Motor Works, was given a dinner last Friday night by fifty executives of the company to celebrate the second anniversary of his taking over Olds management. Hardy spoke with great confidence of the future of the company, in remarks following the dinner.

Jay and Warren Resign

Frank Jay, for years president of the Stanley Motor Carriage Co. of Newton, Mass., at present operated under the direction of Receiver S. L. G. Knox, has severed his connection with the Stanley company, as has Prescott Warren, vice-president. The future plans of Jay and Warren have not been announced.

Waker Robert Bosch Treasurer

H. Waker has been appointed treasurer of the Robert Bosch Magneto Co., Inc., of New York City, manufacturer of Robert Bosch magnetos, spark plugs, horns, spot lights and associated products.

Australian on Special Trip Here

H. C. Richards, chairman of the Federal Council of Australian Motor Traders and member of the State Parliament of South Australia, is making a special trip to the United States to study modern transportation methods. Richards will confer with the National Automobile Chamber of Commerce on the coordination of motor and rail transport.

Dort Advances Johnson

Courtney Johnson has been chosen assistant general manager of the Dort Motor Car Co. of Flint, Mich. Johnson has been with Dort since 1915 and has been head of the advertising department. He will continue to handle the advertising in addition to carrying out his other duties.

Shaw Joins Courier

David Minard Shaw, formerly assistant general sales and advertising manager of the Earl Motors Manufacturing Co., has joined the executive staff of the Courier Motors Co. as general sales manager in charge of the sales and advertising departments. Shaw will be located at the plant at Sandusky, Ohio.

Pilot Makes Appointments

Charles Percell has been appointed retail sales manager; James Blanford, service manager, and William Englemeyer, wholesale manager, by the Pilot Motor Car Co. of Richmond, Ind.

Black & Decker Names Hall

C. M. Hall has been named as Cleveland manager of the Black & Decker

Manufacturing Co. of Baltimore. For the past year he has represented the company in Ohio and Indiana.

Cardway Handling Peerless

Col. Fred Cardway has been named export manager of the Peerless Motor Car Co., with offices at 342 Madison Avenue, New York City. Cardway is a veteran in the export field and is particularly well known in South America.

Dinner for Fred Wagner

Fred J. Wagner, famed in racing history, will be the guest of honor at a dinner to be given by the New York Motor Club at the Hotel Astor in New York City, Monday evening, June 4. This complimentary dinner is to be a farewell to Wagner, who is removing to Los Angeles, where he will be interested in the Wagner & Webb Co., automobile painting and refinishing.

Frech Goes with Federal Truck

E. R. Frech, formerly manager of the national sales division of the Packard Motor Car Co., has joined the national sales department of the Federal Motor Truck Co., with headquarters in Chicago.

Bostwick Goes to New York

O. M. Bostwick, for ten years in charge of advertising of the Sprague Electric Co. of Schenectady, N. Y., has been placed in charge of the New York office of the advertising department of the company. He will be located at 120 Broadway.

Creider Handles Oilgear Sales

W. D. Creider has been appointed sales manager of the Oilgear Co. of Milwaukee, manufacturer of hydraulic power transmissions. Formerly he was in charge of the Milwaukee office of the Federal Machinery Sales Co. of Chicago. A. L. Ellis, who has been the Oilgear company's acting sales manager for the past year, has been appointed eastern representative of the company, with headquarters in New York City.

Stromberg Appoints Hansen

H. A. Hansen has been appointed manager of the Detroit branch of the Stromberg Motor Devices Co. of Chicago. Hansen has been with the company in a sales and engineering capacity for the past twelve years.

Neale Heads Moltrup Office

Charles T. Neale, district sales manager, has been placed in charge of the office opened by the Moltrup Steel Products Co. of Beaver Falls, N. Y., at 303 White Building, Buffalo.

Ford Submits Plans for St. Paul Project

Federal Power Commission Asked to Rule on Application for Water Rights

WASHINGTON, May 23—Full details of the Ford Motor Co. plans for a factory at St. Paul were filed today with the Federal Power Commission and War Department. The commission has been asked to rule upon the application for water power rights immediately.

The Ford company plans to construct manufacturing and assembling building units at St. Paul which when in operation will give employment to from 10,000 to 14,000 workmen with an annual payroll of approximately \$25,000,000.

The plans were prepared under the direction of Chief Engineer Mayo of the Ford company. The factory will be on the St. Paul side of the Mississippi River. The power plant will generate 18,000 hp. in four units of 4500 hp. each. It also is proposed to construct a steam auxiliary plant with a capacity of approximately 12,000 hp. to be used when the water power there is seasonally reduced.

Will Have Railroad Connection

The Ford property occupies 167 acres adjacent to the high dam site and will cost \$315,000. Negotiations have been completed for suitable railroad connections and street car facilities which will make the factory easily accessible to labor from the twin cities.

The blue prints show a factory approximately 600 by 1700 ft. It is Ford's intention to begin the construction of the first manufacturing and assembling unit at once. This unit will be devoted in the beginning to the assembly of complete automobiles, tractors and trucks, and the manufacture of replacement parts required to supply the Minnesota and other districts in the vicinity of the factory.

Jordan Will Announce Lower Prices May 27

CLEVELAND, May 24—Reductions in all models of Jordan cars will be announced on Sunday, according to Edward Jordan, who declined, because of agreement with distributors, to give new prices in advance of May 27.

The new prices were agreed on with a view to giving Jordan price leadership in its field. Jordan has increased sales several times above the volume of last year, and the new prices have been made possible through greater production that lowered overhead.

Slowing Up Evident in Sale of Open Cars

Dealers Have Surplus of These
Models and Not a Sufficient
Supply of Closed

(Continued from page 1144)

PITTSBURGH—Open car sales continue to hold their own, but there has been a perceptible falling off in the sales of closed models, largely because dealers have been unable to make prompt deliveries. Ford dealers are almost able to make spot delivery on all models. The demand for open cars here is somewhat of a surprise, and dealers are inclined to think the slowing up of general business has caused prospects to prune their car budgets.

CLEVELAND—Dealers have not sold so many cars thus far in May as they did in the corresponding period in April, but there has not been a radical drop. Sales are harder to make, however, than they have been. Demand for closed cars has exceeded expectations, and as a result there is a plentiful supply of open cars.

CINCINNATI—Adverse weather conditions have greatly curtailed automobile sales of all descriptions, but it is expected that a few warm days will accelerate the demand. The market for open cars, both new and used, has been considerably weaker than that for closed models. Open air used car display showed about twenty open models to one closed.

INDIANAPOLIS—The upward curve of car sales is beginning to flatten out, although the decline thus far has been relatively unimportant. The falling off has been confined almost exclusively to open cars.

COLUMBUS—Sales of open cars, both new and used, have slowed up a trifle in the past few weeks, although it is attributed to unfavorable weather. Used car sales have been rather slow. Business in the farming sections has been somewhat better.

TOLEDO—Passenger car sales have fallen off approximately 20 per cent as compared with April, although business still is good. Demand for closed cars is much stronger than for open. Used car buying is off about 15 per cent.

MILWAUKEE—Sales of open cars are well sustained, although deliveries from factories are now so heavy that unfilled orders are rapidly being absorbed. Most dealers are from thirty to sixty days behind on orders for closed cars. Used cars are coming into the market in enormous quantities, but sales still are heavy.

CHICAGO—The demand for open cars continues good in this territory, although the preference for closed cars has been more pronounced this spring than ever before. While sales have not declined materially, they have not shown the usual May increase.

DETROIT—Sales of used cars constituted about 75 per cent of the total, and dealers are far behind in deliveries, while open cars can be delivered within a few days.

DES MOINES—Distributors and dealers agree that the demand for open cars has fallen off and that the sale of closed models has been unprecedentedly large in this territory. They attribute this condition in part, however, to bad weather and poor roads.

DENVER—New car sales are about equally divided between open and closed models in the Rocky Mountain territory. General sales are well ahead of a year ago, particularly in farming districts. The used car trade is heavy.

MINNEAPOLIS—Dealers in this district want more open cars than they can get in some models, and some distributors find they are in better condition as to closed car stocks than in the open line, although this territory is generally regarded as a closed car field.

SEATTLE—Dealers selling standard cars are conservatively optimistic over the future, and some of them are behind in deliveries. The purchasing power of the Pacific Northwest is considerably higher than a year ago, particularly the agricultural sections. More cars are going to Alaska than at any time in recent years.

LOS ANGELES—Sales of open cars, both new and used, are slowing up throughout California, but there is a shortage of closed cars of popular makes, and some dealers are sixty days behind in deliveries.

DALLAS—While the demand for closed cars is increasing, even spreading to the rural districts, there has been no slowing up in sales of open cars in this city. The big problem for the Texas retailer now is the used car. Dealers believe the day of the closed model has come and that the situation with respect to used cars will become increasingly serious.

BIRMINGHAM—Sales throughout this territory continue excellent, but business is not quite so strong as it was in March and April. Open and closed cars are sold in about the same proportion. The used car situation is becoming increasingly serious.

LOUISVILLE—Demand for new cars, both open and closed, continues heavy, and May probably will equal April in the number of sales. Closed cars are rapidly increasing in popularity. This has resulted in an accumulation of open cars taken in trade.

ST. LOUIS—Sales in the early part of May were excellent, but they have fallen off rather sharply in the last two weeks. This has been due largely to the unseasonable weather and has resulted in a heavy call for closed models. Dealers are devoting much of their attention to getting as much cash as possible out of their used car stocks.

KANSAS CITY—Sales of both open and closed cars are increasing rather than slowing up in this territory, with closed models selling relatively faster than open.

G. M. C. Plans Body Assembling Plants

Will Establish Them at Home and
Abroad—President Sloan
Tells of Benefits

(Continued from page 1144)

"I believe," he said, "that an airplane picture of Manhattan Island would show dense vehicle traffic on a few streets and comparatively little on others. It seems to be largely a matter of habit. When I take a taxicab, for example, I have to tell the driver not only where to go, but what



Alfred P. Sloan, Jr.

Recently Elected President of General
Motors Corp.

route to take. If I don't, he's sure to turn, almost automatically, into the densest streams of traffic."

He then discussed the Transportation Conference set up by the Chamber of Commerce of the United States and displayed keen interest in the work of the sub-committee on highway transport of which A. H. Swayne, vice-president of General Motors Corp., is chairman.

Reverting to dealer problems, Mr. Sloan declared it seemed to be the unanimous opinion that the used car is the most serious.

"While I can't qualify as an expert on the subject," he said, "it seems to me that the seriousness of this problem for dealers increases directly as their business ability diminishes.

"We should look upon the dealers as our partners," he asserted, "and remember that they must make money if they are to be successful. We must help them in every way we can."

His elevation to the presidency will mean no change whatever in the policies of the corporation, Mr. Sloan asserted emphatically. He paid high tribute to Pierre S. duPont, whom he succeeded, and said that his advice always will be available on important questions of policy.

Flat Rates to Govern Electrical Servicing

Systems to Be Ready in September Following Development by Equipment Makers

DETROIT, May 19—Flat rate systems for installation and repair work on electrical equipment in motor vehicles will be announced and recommended by the Automotive Electric Association and the Automotive Electric Service Association in September, the time between now and then to be occupied in the development of the systems by the manufacturers, and the thorough testing out of them by the authorized dealers.

Plans for placing all work on a flat rate basis were made at a joint meeting in Detroit this week of the service managers' committee of the Automotive Electric Association and the board of governors of the service association. The matter was first taken up at individual meetings of the two groups and then were brought under general discussion at the joint meeting.

Accounting Method Planned

The service association also will develop a simplified method of cost accounting which will be used in conformity with the flat rate plan. In the main this will be designed for the small shop owner, the larger shops now having satisfactory systems. It is the intention of the electric associations to place this branch of the automotive business on a thoroughly efficient basis, the flat rate system being chosen as the most effective way of doing this.

Plans for the two systems following development and trial will be submitted at the summer meeting of the Automotive Electric Association for final approval. The board of governors of the service association will take part in this meeting so that all final details will be considered and cleared away at that time. Following the summer meeting the service association will adopt the new plan unanimously, and its use will be recommended by the manufacturers to all authorized dealers.

Individual Plans Studied

Each electrical equipment manufacturer will draw up an individual flat rate system covering all operations on the individual equipment manufactured. Where installations are concerned, it is planned to have the system set forth a rate inclusive of parts and labor, making it a definite figure to be charged to the customer. As these are drawn, they will be turned over to the service stations for trial and recommendations, will be passed back and forth and necessary changes made before ready for final adoption.

E. E. Turner, manager of the Automotive Electric Association, was chairman of the meeting. Members of the service managers' committee present

were Eby of Remy, Graff of Delco, Walcott of North East, Smith of Splittorf, Devor of Wagner, Murray of Leece-Neve and Shank of Auto-Lite.

Members of the board of governors of the service association in attendance were D. W. Burke, chairman; P. J. Durham, New York; F. W. Duffeck, Toledo; H. B. Noyes, Omaha; Adolph Wagner, Indianapolis; Arthur Jones, Chicago; C. M. Bechtol, Cleveland, and M. M. McFarland, assistant secretary, New York.

A. O. Smith Completing Additions to Factory

MILWAUKEE, May 21—The A. O. Smith Corp. will soon have ready for use a unique storage building capable of holding 60,000 pressed steel frames, with special equipment for receiving, handling and shipping which cuts down labor and expense to an absolute minimum. The design of the building and equipment have been patented by the designers and builders.

The Smith company also is completing a new frame shop with three special machines capable of producing 3600 frames in a 10-hour day with the labor of only 180 men, compared with a former capacity of 3000 frames with the labor of nearly 2000 men.

The shop is now laid out so that plain sheets are received at one end and pass through a series of presses, punches and drills, coming out in finished form at the other end, to which is connected the new patented storage building, which discharges into the shipping building.

Louisville Banks Help Kentucky Wagon Works

LOUISVILLE, KY., May 18—Banks in this city are cooperating to straighten out the difficulties of the Kentucky Wagon Works, according to V. J. Bulleit, chairman of the board of directors of the Lincoln Bank & Trust Co.

A claim for \$65,000 which S. B. Lewis & Co. of Pittsburgh holds against the wagon works will be paid by local bank creditors in order to hold intact the \$1,400,000 materials account of the company, Bulleit says. He also states that the banks have agreed to cooperate with the committee to be appointed by Clarence A. Earl, president of the National Motors Corp., to raise an additional \$1,000,000 to start operations at the various plants which merged into the latter company.

Local bankers have agreed to hold off all claims pending the activities of the committee, Bulleit declares.

While the plant of the Kentucky Wagon Works has been included in the merger with the National Motors Corp., Bulleit explained that material aggregating \$1,400,000 was separate property from which claims of the local creditors could be satisfied. In addition there is \$600,000 of the "B" bonds of the National Motors Corp. held as collateral by the creditors of the wagon works. He states that claims against the latter company approximate \$2,000,000.

Legislatures Adopt Few Theft Measures

North Dakota and Wyoming, Two States That Took Favorable Action

NEW YORK, May 21—Reviewing the efforts on the part of the 1923 legislatures to pass anti-theft measures, the National Automobile Dealers Association states that few have gone through. One of these relates specifically to the theft of accessories and equipment and not to vehicles.

In South Dakota, the certificate of title bill was so weak as to be absurd and valueless, the association says. The Automobile Trade Association of South Dakota, after conferences of its executives and executives of the N. A. D. A., opposed and defeated the bill. It was believed best to have no statute rather than a weak and ineffectual one that would be so farcical as to arouse public disfavor and prove an obstacle to the future passage of a law drawn on the lines of those in Indiana and Maryland.

North Dakota passed the State's first real law in which an attempt is made to safeguard motor vehicles. This bill provides for the filing of bills of sale and other transfers of personal property in much the same manner as is done in the filing and transferring of real estate.

In Wyoming the Barksdale bill, providing for registration of all motor vehicles and also providing for State and municipal police inspection, is the first serious effort in that State to provide statutes aimed at discouraging car thefts. The law also names penalties to be imposed.

Alabama, Arkansas, Delaware, Missouri, Oklahoma, South Carolina, South Dakota and Tennessee failed to pass measures, while in Indiana and Minnesota efforts were made to alter existing statutes without success.

Merger Will Be Known as Climax Engineering

CLINTON, IOWA, May 21—The merger of the Climax Engineering Co. and the Clinton Refrigerating Co., through the purchase of the latter by the former, will now be known as the Climax Refrigerating Co., as stated in AUTOMOTIVE INDUSTRIES May 3. The consolidated business will be carried on as the Climax Engineering Co. under the guidance of President G. W. Cravens, with G. W. Dulany, Jr., chairman of the board.

The company has increased its capital stock from \$500,000 to \$2,000,000 and is arranging to triple the size of its plant. When completed, the new line will include the present Climax gasoline engines in both four and six-cylinder units; Clinton refrigerating machines and a new line of Diesel engines and automotive steam engines.

Harry Stutz Enters Memorial Day Race

Two H. C. S. Specials, with Miller
Engines, to Compete at
Indianapolis

INDIANAPOLIS, May 21—The big pre-race sensation is the announcement that Harry C. Stutz has returned to sport and that there will be two H. C. S. Specials in the eleventh annual 500-mile sweepstakes to be run on the Indianapolis speedway May 30. The cars will be driven by Tommy Milton, national champion in 1922, and Howard Wilcox, winner of the 1919 Indianapolis event, making one of the strongest combinations in the classic.

Eight-Cylinder Engines

The H. C. S. entries are Miller-engined jobs, carrying eight cylinders, being the same cars brought here from California by Miller, who has eleven cars altogether in the race, four of them having been rebuilt from 183-inch cars of last year. Harry Stutz has his entries in the factory, making some chassis changes, the nature of which he will not divulge at present. He will paint them white, of course, that being the color made famous in other years when Harry Stutz's entry swept the boards.

The announcement came as a complete surprise, so carefully did Stutz guard his secret, but the announcement was pleasing news to those race fans who have been sighing for the manufacturers again to take up racing. With Harry Stutz entered, the factories now are well represented, for in the field of thirty-five there are nominations by Packard, Duesenberg and Harry Stutz representing America, while the Durant nominations can be classed "factory" because of Cliff Durant's connection with Durant Motors, Inc.

It needed only the H. C. S. declaration to make up an extraordinarily strong field for the classic which is to be run on Memorial Day. Packard with De Palma, Resta and Boyer driving, will be hard to beat, it is thought. Cliff Durant is relying on Jimmy Murphy, Harry Hartz, Eddie Hearne, Earl Cooper, Leon Duray, Harlan Fengler and himself. Duesenberg has not yet named his drivers.

Louis Chevrolet Represented

Louis Chevrolet is represented by the Scheel-Frontenac team whose three cars are fitted with rotary valve engines, made by the Scheel Motors Co. of St. Louis, the chassis being Frontenacs. Dave Lewis, Ira Vail and Cornelius Van Ranst will be the drivers. The rest of the American entries is made up of the Miller Special to be driven by Bennett Hill; the Barber-Warnock Special, which is mostly Ford; the F. H. W. Special to be driven by F. H. Wells and a couple of others about which not much is known.

From abroad come the Mercedes, Bu-

PIKE'S PEAK CLIMB BARRED TO FREAKS

COLORADO SPRINGS, COLO., May 21—Promoters of the annual Pike's Peak hill climb, scheduled for Sept. 3, have changed the conditions of the classic by which freak cars are barred from the event. No car weighing less than 1600 lb., exclusive of the driver, will be permitted to compete in the 183 in. cubic displacement class, while the minimum weight in the others will be 1800 in the 183-300 class and 2000 in the division above 300.

These restrictions, it is thought, will produce entries from manufacturers who heretofore have held aloof because of the freaks. The first declaration is the nomination of a Mercer, which will be driven by W. S. Haines.

gatti, Schmidt Special and Rolland-Pilain, ten in all, and it is thought that the Americans will have plenty of competition. The foreigners come with their best pilots, Lautenschlager of the Mercedes having won two French Grand Prix events, first in 1908 and again in 1914. Sailer and Werner, his teammates, also have ability out of the ordinary. Of the others Jules Goux, in a Schmidt Special, who won at Indianapolis several years ago, and Albert Guyot in a French Rolland-Pilain are best known.

All plans for the race have been completed. The advance sale of tickets is greater than ever before while the field certainly is above the ordinary in the matter of entries. David Beecroft of the Class Journal Co. is to referee the race, Eddie Rickenbacker will be starter and F. E. Edwards, chairman of the technical committee. The pacemaking car will be a Duesenberg.

Atlas Radiator Maker to Widen Distribution

CINCINNATI, May 18—George Fritz, former field secretary of the Automotive Equipment Association, has become vice-president and general sales manager of the Steidle Manufacturing Co. of this city, maker of the Atlas radiator for Ford cars. In addition to Fritz, officers of the company are: Frank Steidle, president, and Richard J. Hollmeyer, secretary and treasurer.

The Steidle Manufacturing Co., which has been a copartnership, has been incorporated with an authorized capital of \$150,000. In connection with the reorganization it is planned to enlarge distribution of the company's product, which will be sold only through the jobbing trade. The Atlas radiator has been manufactured for two years.

George Fritz has been identified with the automotive industry since 1903.

Firestone Tire Quits Rubber Association

President Disagrees with Policy
Adopted Toward British
Restriction Act

(Continued from page 1146)

The Hotchkiss committee also has been informed that the reported heavy shipments of rubber from the East are due largely to stocks accumulated before the introduction of the Stevenson plan, and that strong measures are and will be taken by the British and Colonial Governments to put a stop to smuggling and leakage through other sources.

New Malay Regulations

The Federated Malay States Government has adopted a new rule under the Rubber Act regulating exports of rubber from British Colonies, which prohibits the transfer of licenses or coupons except on proof of the bona-fide sale of rubber covered thereby. In addition to this, licensed dealers in the East are now forbidden to possess any rubber in excess of the quantity for which coupons or export licenses are held. Any excess rubber held at May 1 must be reported to the Government and cannot be disposed of without written permission.

"It appears evident that, despite the strong representations of the Rubber Association of America and of certain British manufacturers, the British Colonial Office adheres to the belief that restriction is still necessary to stabilize prices at a level sufficiently high to enable the average plantation to earn a reasonable return upon the investment and to encourage new planting and insure future supplies," says the American committee.

Association States Position

In a bulletin just issued, the Rubber association's committee states that it wishes at this time to emphasize the following points for consideration:

That the American industry should be influenced primarily by a long view, realizing that, with or without restriction, prices must range considerably in excess of those prevailing during the economic depression of 1921 and 1922.

That the Rubber Association of America condemns restrictions as an economic mistake, believing that, in view of consumption, prices will right themselves without Governmental interference.

That from an economic standpoint it is to the selfish interest of British growers themselves to operate their plantations on a 100 per cent basis just as soon as it can be demonstrated that the world's supply of rubber is not in excess of the demand. At the present time the British are operating in competition with the Dutch, who are unrestricted.

That the investigation of rubber sources, present and future, by the United States Government has the hearty endorsement and cooperation of the Rubber Association of America.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Further slowing down in forward buying in some lines of trade was reported last week, with unseasonable weather retarding retail trade in some sections of the country.

Production and distribution in general show little effects of the slower forward buying. Steel ingot production last week was reported as representing an annual rate of 50,000,000 tons, or 1,000,000 tons more than the rate represented by April's output.

Cotton spinning in April was at a lower rate than in March. For the month there was a reduction of 743,500,000 active spindle hours.

Car loadings in the week ended May 5, 961,029, were 2665 under the loadings of the preceding week.

Wholesale prices show a continued decline of one point a week. For the week ended May 18, this index showed a decline of 3 per cent from the year's high point, reached the first week in April.

The increase of \$668,000,000 in bank debits reported to the Federal Reserve Board for the week ended May 16, was an advance of 7 per cent, but did not equal the decline reported a week earlier.

In the week ended May 16, discounts by the Federal Reserve Banks increased \$2,314,000. Each of the banks, except the New York institution, reported increased holdings, aggregating in round numbers \$48,000,000, against a decline of \$46,000,000 at the New York Reserve Bank. The net gain in discounts in four weeks has been \$54,000,000. Deposits showed an advance for the week of \$56,021,000, and Federal reserve note circulation a decline of \$8,820,000, the reserve ratio declining from 76.1 to 75.3 per cent.

For the week ended May 9, the reporting member banks showed a reduction of \$64,260,000 in loans, wholly in the obligations secured by stocks and bonds other than Government. This change reflected chiefly the decline in loans on stocks and bonds by New York City banks.

Stromberg's Net Profits

Last Year Were \$604,263

CHICAGO, May 21—The report of the Stromberg Carburetor Co. of America, Inc., for the year ended Dec. 31, 1922, shows net profits of \$604,263 after the usual deductions, which is equivalent to \$8.05 a share earned on 75,000 shares of capital stock of no par value as compared with net profits of \$81,670 or \$1.08 a share in 1921.

The company's consolidated balance sheet as of March 31, 1923, follows:

Assets: Cash, \$543,421; Liberty bonds, \$80,658; other bonds, \$51,023; notes and accounts receivable, \$507,962; inventories, \$771,869; other assets, \$15,028; property and plant, \$1,989,598, and patents, \$175,745.

Liabilities: Accounts payable and accrued accounts, \$184,376; reserve for Federal taxes, \$101,750; reserve for depreciation, \$506,109; capital stock, comprised of 75,000 shares of no par \$375,000 and surplus, \$2,993,746.

For the quarter ended March 31, 1923, the company shows a net profit of \$254,528, after expenses and Federal taxes, equivalent to \$3.39 a share. This compares with \$30,266 or 40 cents a share in the first quarter of 1922.

FINANCIAL NOTES

Michigan Securities Commission has approved the issuance of stock by the following companies: Bassick-Alemite Corp., 50 shares of non-par stock at \$27.50 a share, and \$1,250,000 of 7 per cent collateral trust serial gold notes; Detroit Aero Metals Co., 250,000 shares common stock at \$1 a share; Detroit Auto Body Co., \$100,000 preferred stock and 655,555 1/3 shares of common stock non-par at \$9 a share, the entire issue of 800,000 shares non-par being validated; Detroit Steel Corp., \$443,750 common stock, the entire issue of \$500,000 being validated; Great Lakes Drop Forge Co., \$215,540 preferred stock, and 5438 1/2 shares non-par validated to be given as bonus with preferred; Lapeer Trailer Co., \$25,000 common stock; Motor Wheel Corp., \$2,000,000 ten-year 6 per cent S. F. Gold Bonds; National Brass Co., \$100,000 preferred stock; C. T. Wright Engine & Tractor Co., \$200,000 preferred stock, 10,000 shares non-par at \$5; Wolverine Casting Co., \$10,000 common stock.

Sparks-Withington Co., following action by stockholders, will change its financing plans to permit of the retirement of one-half of the present outstanding preferred stock through sinking fund operation and will convert the rest into common stock on the basis of four shares of common for one of preferred. The company was reported in strong financial condition with no need for additional funds. The company had \$1,000,000 of 7 per cent cumulative preferred authorized of which \$488,500 was outstanding, \$11,500 of the half million originally issued having been retired through sinking fund operation. The remainder will be split into \$244,200 of 7 per cent cumulative sinking fund preferred, and \$244,300 of 7 per cent cumulative convertible preferred. The 30,972 shares of common stock outstanding will remain unchanged.

Rickenbacker Motor Co., in its balance sheet as of March 31, shows the following assets and liabilities: Assets—Plant, equipment and fixtures, less reserve for depreciation, \$2,053,548; patterns, dies, models and good-will, \$960,466; current resources, \$3,133,426; balance due on stock subscriptions, \$827,860; deferred charges to future operations, \$296,680. Liabilities—Capital stock, \$4,664,210; bonds, \$400,000; current liabilities, \$1,656,640; deposit on discontinued contracts, \$39,500; surplus, \$511,630.

Hudson Motor Car Co. has declared an extra dividend of 25 cents a share and the regular quarterly dividend of 50 cents, both payable July 2 to stock of record June 22.

FACTORY FOR ROBE CAR

NORFOLK, VA., May 22—A factory for the manufacture of the Robe Light-Six is being constructed at Nansemond, between Norfolk and Suffolk. The car will sell for \$895, it is stated.

**Anderson Increases
"Aluminum Six" List**

Advance, Company Says, Is Due to Higher Price Paid for Materials

ROCK HILL, S. C., May 21—Due to advances in the cost of steel and aluminum, the Anderson Motor Car Co. has increased the price of its closed cars on the "Aluminum Six" chassis, Series 41, ranging from \$45 to \$100. There will be no immediate increase on either of the two open models on the 41 chassis or the entire line of Series 50.

The new schedule on Series 41 is as follows:

	Old Price	New Price
5-pass. standard phaeton.	\$1,195	\$1,195
4-pass. sport phaeton.....	1,395	1,395
4-pass. coach.....	1,450	1,495
5-pass. standard sedan....	1,595	1,695
5-pass. sport sedan.....	1,745	1,795

The Anderson company reports that during April it produced more cars than ever before in its history.

**Sterling Price Advance
Ranges from \$355 to \$500**

MILWAUKEE, May 19—The Sterling Motor Truck Co. has announced an advance in the price of its entire line. The increases vary from \$355 on the lighter models to \$500 on the heavier trucks. The schedule is as follows:

	Old Price	New Price
1 1/2-ton	\$2,885	\$3,240
2-ton	3,085	3,440
2 1/2-ton	3,290	3,700
3 1/2-ton	4,325	4,750
5-ton (worm drive).....	4,950	5,400
5-ton (chain drive).....	5,500	6,000
7 1/2-ton	6,000	6,500

An extra charge for the long wheelbase chassis on each model is made, and lists as follows: On the 1 1/2, 2 and 2 1/2-ton trucks, \$50; 3 1/2-ton, \$75, and \$100 on the two 5-ton and the 7 1/2-ton chassis.

**Chandler Lists Increased
\$90 on Nearly Full Line**

CLEVELAND, May 19—With the exception of three models, the Chandler Motor Car Co. has increased its prices \$90. The price of the limousine and the two-passenger roadster remain unchanged, while that of the four-passenger Metropolitan sedan has been advanced \$75.

The new and old prices are as follows:

	Old Price	New Price
2-pass. roadster.....	\$1,595	\$1,595
4-pass. roadster.....	1,595	1,695
5-pass. phaeton.....	1,395	1,485
7-pass. phaeton	1,545	1,635
4-pass. sedan (Dispatch).....	1,695	1,785
5-pass. sedan (Chummy).....	1,695	1,785
4-pass. sedan (Metropolitan)...	2,195	2,270
7-pass. sedan.....	2,295	2,385
Limousine.....	2,995	2,995

Demand Keeping Up, Steel Makers State

They Are Looking for Seasonal Decline in Automobile Sheet Business

PITTSBURGH, May 21—Steel producers say that the new business from automobile companies continues satisfactory. It is stated, however, that sheet producers are expecting a falling off in automobile sheet business within sixty days, but this is declared to be seasonal.

It is claimed that when the automobile producers cut production it will not be considered a loss of moment to the steel producers as far as tonnage is concerned. In short, it is figured out a loss of 10 per cent in the production of automobiles, if this was passed on to the steel plants, would mean but a tonnage loss of perhaps 2 per cent.

In no instance does the output of any sheet plant of any size in the Pittsburgh district run beyond 20 per cent in full finished automobile sheets, except perhaps one or two. In this latter class is placed the West Pennsylvania Steel Co., which is said to devote a large percentage of its output to the automobile industry.

There is no record here of any cancellations as yet, but requests for postponements of deliveries are said to have been received. Rumors have been received here via Wall Street that Ford might cut his prices, but in authoritative circles it was stated that such action was usually preceded by a notice from Ford that on and after such a date he would pay so much less for his steel products, and it is reported no such notice has been received by plants here.

Holmes Sold Bondholders Who May Reorganize It

CANTON, OHIO, May 19—Steps are to be taken toward the reorganization of the Holmes Automobile Co., manufacturer of the Holmes air cooled car, following the sale of the property this week to the bondholders of the company, according to Clarence Herbruck, counsel for the bondholders.

After a hearing before the referee in bankruptcy, Attorney Celsus Pomerene, the holders of the outstanding bonds took over the plant with the purpose of effecting a reorganization and resuming operations.

PRESTON RECEIVER NAMED

BIRMINGHAM, ALA., May 18—Attorneys for the Preston Motors Corp. have withdrawn their petition for a jury trial to determine whether the concern should be adjudged an involuntary bankrupt, and Judge W. I. Grubb of the Federal Court has declared the company an involuntary bankrupt and appointed John S. Coxe receiver.

A complete statement of the company's assets and liabilities is not available, but it is estimated that the property owned by the company has a net worth in excess of \$500,000.

INDUSTRIAL NOTES

Columbia Steel & Shafting Co., Pittsburgh, has purchased the entire stock of shafting and machinery of the Brightman Manufacturing Co. of Columbus, Ohio. The latter company will devote itself to the manufacture of superior milled-from-bar nuts and shafting machinery and also will retain its equipment for finishing its own hexagon bars from the rough stock.

Wenstone Rubber Products Co., Chicago, which in January acquired the plant of the Boone Tire & Rubber Co. at Chippewa Falls, Wis., expects to have the factory in operation on a normal production schedule with 200 men on June 1. The factory at Chippewa Falls has been idle for a year or more.

W. D. Blood and a corps of territorial salesmen will cover all foreign countries for the McQuay-Norris Manufacturing Co., with factories in St. Louis, Connersville and Indianapolis, which has just established an export department in New York City.

Ohio Rubber & Textile Co. is the new name selected by the Ohio Rubber Co. of Cleveland as being more indicative of the products of the company which include carpets, upholstery and all automobile textile products.

Birmingham Tire & Rubber Co.'s tire plant in Birmingham, Ala., is ready for operation and production is expected to start within a week. The tires, both cord and fabric, will bear the name "Birmingham."

Bendix Engineering Works, Inc., has moved its general offices from 327 South LaSalle Street to Room 1959, Illinois Merchants Bank Building, Jackson Boulevard and Clark Street, Chicago.

Whitman & Barnes Manufacturing Co., maker of twist drills and reamers, has removed its New York office and store to 99 Chambers Street, a block and a half from its old location.

Dalton & Balch, Inc., of Chicago, has completed arrangements for the manufacture of its timing gears in Canada, its factory being located at Toronto.

L. M. Serrick, Toledo, has bought the Defiance K & Z Automatic Screw Machine Co. at receiver's sale and plans to reorganize and incorporate under a new name.

James R. Findlater, Earl Vice-President, Is Dead

DETROIT, May 22—James R. Findlater, vice-president and sales manager for the Pacific States for the Earl Motors Corp., died this week in Detroit after an illness of over a year. He was fifty-five years old.

Mr. Findlater was a native Detroit. He became associated with Benjamin Briscoe fifteen years ago in Chicago and was one of the founders of the Briscoe Motor Corp., since changed to Earl Motors. Failing health compelled him to remove to a milder climate, and for the last two years he has made his headquarters in San Francisco, from which point he supervised Earl sales on the coast. He recently returned to Detroit, as his health became worse.

METAL MARKETS

One of the redeeming features of the decline in fresh buying of steel products is the relative ease with which non-integrated sheet rollers can now obtain sheet bars. Almost any delivery position is now obtainable at \$45, Pittsburgh or Youngstown, with the undertone of the semi-finished market indicating the possibility of further developments in buyers' favor. One has but to view in retrospect the conditions that prevailed in the sheet bar market last month to see clearly that after all a most decided change has come over the steel situation.

Early in April mills to which non-integrated sheet rollers look for their supplies let it be understood that they had allotted among their regular customers all the sheet bars they could produce, and that they had no additional tonnages to offer. As to price, if a sheet maker who was caught short could locate bars anywhere, he would have to pay from \$47.50 to \$50. During the last week in April the situation had changed sufficiently to bring about a revision of producers' ideas as to prices. If they had any bars for sale, they would book business at \$45. Now they have sheet bars for sale and are apparently eager for \$45 business.

Unless unforeseen developments upset the orderly onward march of price adjustment, this same step-by-step modifying process will eventually make itself felt in the market for finished steel. For the time being sufficient impetus for rapid price changes is lacking. Producers have a comfortable quota of business on their books, and consumers are not forced by their own operating schedules to worry greatly about steel supplies later in the year. Recent Pittsburgh market reports have stressed the ease with which independent sheet producers are duplicating the pace at which the chief interest is reported to have disposed of its third quarter output. Unquestionably a good deal of business has been placed, especially for July shipment, but the attitude of sales managers clearly discloses that they are in a receptive mood for additional third quarter commitments. Significant is also the fact that one hears very little these days about "attractive specifications," a stock phrase so frequently encountered a few months ago. A fair amount of buying of cold-drawn steel bars has taken place, but the pace has slowed up somewhat and the market is very easy.

Pig Iron.—The amount of business passing in foundry and malleable grades is so light that there is no way of appraising the market. Production at most of the blast furnaces continues at a high rate, and if the prevailing apathy of consumers continues, selling pressure, for the moment restrained, must eventually make itself felt with a consequent readjustment of market levels.

Aluminum.—If there were any undigested surplus of aluminum, the present lull in buying would be reflected in easier market conditions. Values, however, are supported by the lack of foreign surplus output. The domestic producer's rolling capacity is still fully engaged. The scrap and remelted markets are somewhat easier.

Copper.—Although the market's morale is improved, consumers are not yet taking hold in whole-hearted manner. Downward revision of prices for wrought copper and brass products is hoped to bring out some fresh buying, and on the basis of this response rolling mills will cover their raw copper wants. A buying movement may be said to be under way, but it is not looked for to assume any spectacular proportions.

Calendar

SHOWS

Sept. 1-7—Chicago, National Transportation Exhibition, under the auspices of Motor Truck Industries, Coliseum and Annex.

Nov. 4-10—New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

May 9-June 12—Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4-14—Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 15-20—London, Motorcycle Show, Olympia.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

Nov. 1-15—Buenos Aires, Annual Automobile Exposition, under the direction of the Automovil Club Argentino.

Nov. 2-10—London, Automobile Show, Olympia.

Nov. 22-Dec. 1—London, Motor Transport Exhibition.

RACES

May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.

July 2—Tours, French Grand Prix 500-mile race.

Sept. 3—Annual Pikes Peak Hill Climb.

Oct. 28—Barcelona, Spain, Grand Prix for vehicles of 1500 c.c.; Nov. 1, International Grand Prix for cycle cars of 1100—Nov. 4, International Grand Prix for two liter.

CONVENTIONS

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

Nov. 12-17—Chicago, Annual Business Exhibit and Convention of the Automotive Equipment Association, Coliseum.

S. A. E. MEETINGS

June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.
Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

MEETINGS

June 7—New York, Annual Meeting of the National Automobile Chamber of Commerce.

June 14-15—Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.

June 25-July 1—Dixville Notch, N. H., Summer Meeting of the Automotive Equipment Association.

Bank Deposits Show Alabama Prosperous

(Continued from page 1151)

These will put hundreds of people in a position to use automobiles that have never been able, heretofore, to see where they would get anything out of owning a car.

In addition to the above, 579 miles of roads are being contracted for at present. So rapid is the construction of highways throughout the State that it is figured within the next twelve months practically 1000 miles, in addition to the 450 already completed, will be ready for use. This will form more than one-third of Alabama's entire Federal aid system.

The cotton crop of Alabama will have a great deal to do with the sale of automobiles during the coming summer and fall months. The farmers are staking considerable money on a good crop and high prices. Weather conditions have been poor to date, with too much rain and not enough heat for cotton. A great deal of the negro labor in these sections has been drawn away by industries (both in the North and the South) offering high wages.

Crops Appear Good

More fertilizer has been used this year in Alabama, however, than in any year since the World War, and in spite of a shortage of labor and bad weather conditions, the crop in the southern portion of Alabama is up to a good stand and is not far behind what it should be at this time of the year. In North Alabama the cotton crop is not advanced as it should be, but the farmers are doing good work and it is expected that just as soon as the warm weather of the latter part of May and June arrives this crop will catch up the time lost.

The industries of Birmingham and the entire industrial section of North Alabama are still going ahead rapidly. The production of pig iron during the first four months of 1923 was 73 per cent

ahead of that of the same months of 1922, and almost meeting the record of all time which was made during the first four months of 1917. It is expected that the production will go ahead of that of 1917 before the end of the year, as there are several furnaces to be put into blast and the demand is taking all the pig iron that is produced.

Other branches of the iron and steel business are enjoying equal increases in production and real prosperity. In addition to this, new industries put into operation to date this year and to be put into operation during the next two months will take between 5000 and 7000 men to operate.

With the excellent condition of the people of Alabama evidenced in the increase in bank deposits and the industrial activities, a good cotton crop, which will almost of necessity bring a high price, will put the people of the State in the best position to buy automobiles that they have experienced in the past five years. Added to this will be the urge to buy cars in order to use the excellent roads that are now being rapidly completed by the State Highway Department. Alabama will bear the closest attention from automobile manufacturers in the next year, and particularly during the next six months.

ROLLS-ROYCE DEMAND STEADY

SPRINGFIELD, MASS., May 21—A steady, firm demand is reported by Rolls-Royce of America, Inc., with production for the first four months of this year 100 per cent greater than for any previous four months. About 1000 persons are now employed at the chassis and coach plants. Prospects for the rest of the year are reported as excellent.

CORRECTION

In announcing the formation of the Continental European Anderson Gear Co. in its issue of May 10, AUTOMOTIVE INDUSTRIES stated that the company would market cold rolled gears under the Anderson process. This should have read "hot rolled gear."

Open Cars Overload Trade in New York

NEW YORK, May 19—After a fine start the first ten days of the month, passenger car sales in the metropolitan territory have declined, and there are strong indications that the month will prove a disappointment to the majority of the trade. Distributors and branch managers have not been able to determine whether unseasonable cold weather, the unsettled condition of the stock market or a slackening in business in a number of lines other than automotive is the principal cause of the setback.

Stagnation is principally in open car models. Representatives of some of the large volume producers, who have been running factories up to capacity and so turning out open cars considerably in excess of closed car production, have slightly uncomfortable overstocks of open cars.

Omit Ordering Phaetons

In several cases New York distributors, in making up their June shipping orders, have left standard phaetons entirely out of their schedules, thus seeking an opportunity to dispose of open cars in June that they expected to sell in May. Representatives of some of the factories which did not get into big volume production, and whose closed cars aggregate 65 or 70 per cent of the total volume, are in better position.

It is becoming apparent that sales organizations in this territory will have to resort to decidedly aggressive work to bring sales up to expectations from now until the first of July, when a normal seasonal drop is expected.

The used car market, which has been lively all through the spring, has declined with the demand for new cars. Used open models particularly are not selling well, but in most organizations there is no alarming accumulation because the demand has been so good through March and April and the early part of May.